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ELECTRICAL REVIEW.

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EARNINGS AND HOURS OF LABOUR.

IN the history of economic science, and in particular in the history of the immediate present, the time-lag between any event and its appearance in official chronicles is, of necessity, a long one. Even in that highly organised branch of statistical science, the monthly trade return, we find a period of approximately eight to ten days elapsing between the end of a month and the publication of summarised trade returns. In this instance a splendid organisation, compulsory returns, and simple methods of analysis, do well to let us have approximate returns so promptly. Where, however, investigations are made at wide intervals, where the making of returns is a voluntary pastime, and where the analysing of such returns is a matter of tedious complexity, a much larger time element naturally intervenes.

When, therefore, in this year of 1911, with its peculiar conditions of social stress, we received the Board of Trade Report on earnings and hours of labour in the metal, engineering and ship-building trades in 1906, the first natural inclination was to ask what 1906 had to do with us, and of what value such information could be in the solution of the problems of to-day. The value, however, of this statistical return of nearly 200 foolscap pages is not semi-archaeological. In itself it may be regarded as one slab in the tesselated pavement of complicated design along which our civilisation is marching. In the abstracts which we publish on another page we have regarded it as a statement of facts by itself without relation to other facts. Here we would like to refer rather to related phenomena. Summarising our own abstracts, we have outstanding a gross advance in money wages for those working full time in these industries, averaging 25·7 per cent., and ranging from 30·5 per cent. in the pig-iron trade, to 22·2 per cent. in ship and boat building and repairing and in railway carriage and wagon building. Taking the metal industries alone, what are the immediate relevant facts? Rise of money wages by itself means nothing—changes in purchasing value are modifying factors. Then again, changes in market prices of both the finished commodity and its main component raw materials are useful in the determination of how far labour is getting what the would-be syndicalist with a ruthless disregard of economics would term its fair share of the profits of the industry. Figures from the Census of Production returns, when we are able to compare a number of such, will be very helpful. In default of such, we instance the fact that the index number of prices of minerals rose from 67 in 1886, to 101 in 1906, and fell to 89 in 1910. During the same years the index number of food prices (Sauerbecks) fell from 72 in 1886, to 69 in 1906, and rose to 74 in 1910.

Over and beyond the changes due to alternations of

activity and depression there have to be reckoned the joint phenomena of interacting causes, some making for increased price in fuel, others making for a decreased amount of fuel per unit of output, while in regard to labour itself there are the results of labour-saving machinery tending to relegate large masses of unskilled labour into casual labour, which latter under process of accumulated unemployment produces the loafer classes. Against this loss at the one end of the scale we have the wider development of skilled trades in making such appliances and the selection of the more intelligent of the previously unskilled for the handling of such apparatus. There is thus a greater natural bias towards enmity between the unskilled and the skilled artisan than between the unskilled labourer and the employer. At first the demagogue fostered the former, as is chronicled in the history of our textile trades; latterly, he has fostered the latter. In so doing his actions are as intrinsically illogical as before. The employer has to hire his capital every bit as much as he has to hire his labour. The capitalist when all is said and done is merely the great mass of the people. Quite apart from individual investments in industrial companies there are the collective investments of all sections of the public through banks, insurance companies, or building societies, to say nothing of the vast circulations of capital by the State and municipal authorities.

Wages, after all, are but a counter in the game. The principal struggle is between the food producer and the food purchaser. Plenitude of foodstuffs means a large manufacturing output of clothes and the appurtenances which administer to the comforts of our civilisation. Glut and scarcity follow like sunshine and rain. If a fictitious value be given to the wages counter, we are, to use an expressive Americanism, "up against" a two-stage problem. First, the manufacturing countries producing at a cheaper rate will be enabled to purchase therewith more foodstuffs than the countries manufacturing at a dearer rate; and secondly, the well-fed virile country will dominate the weaker as certainly as carnivorous animals prey on the herbivorous.

Economic operations are distinct from surgical ones in that we cannot, under the action of a general anæsthetic, remove the abscess from a vital organ. Economic operations are slow and painful, and the patient retains full consciousness of pain throughout. We cannot beguile ourselves with any equivalent of Christian Science that there is such a thing industrially and nationally as the survival of the unfit. Altered environments must be recognised, and industrial survival will depend upon our adaptiveness thereto. It is good nationally that the individual standard of wealth should be raised, but it is better that this should be accompanied by its intelligent employment.

Money wages, as the return before us shows, rose very largely in the two decades ending in 1906. The food-purchasing value of the wages rose until 1901. During the past 10 years the food-purchasing value of the pound sterling has fallen. It is in this, in combination with the segregation of large masses of unskilled labour into the two groups of the semi-skilled operators of labour-saving appliances, and of the casuals drifting from the unemployed stage to the unemployable, that we probably have one cause of our present feverish industrial unrest. Pathologically an abscess sets up a high temperature in a patient which falls when the pressure is released, and the pus is drained away. Careful concerted national thought will enable us to get back to a fairly normal condition. Absolute equilibrium is impossible until we can conceive as aught but speculative a planet in which rainfall and sunshine were always constant, population was stationary, both numerically and in its demands, in which there was no exhaustion of soil, but crops were always the same, and supply and demand exactly balanced. For our industrial ills we want no quack remedies. We must, however, find our answer to the questions before us. The riddle of the Sphinx has to be answered, and answered correctly, or the Sphinx will turn and rend us. In framing the course of action which will be our answer, we must consider the evidence of statistician and sociologist. The return in question is a survey of one of the tiles wherewith we are either building stairs to lead us to higher things, or are paving a path of good intentions to the proverbial igneous and inglorious ending.

The I.E.E. Articles.

On Wednesday last week a notice was issued to corporate members of the Institution of Electrical Engineers that an extraordinary general meeting would be held on November 2nd to consider, and if thought fit, to pass a resolution approving and adopting new Articles of Association, of which a copy was enclosed with the notice. It will be observed that exactly a week's notice was given, during which members must decide upon their attitude towards the new proposals. Seeing that the latter include important changes in the conditions of membership, affecting existing as well as prospective members, the period allowed for their digestion (the minimum permitted by the Articles) appears absurdly inadequate, and unnecessarily so.

In fact, the whole proceeding has an air of precipitation; the new Articles have been sprung upon members just previously to the commencement of the Session, and are apparently to be got out of the way before an opportunity is afforded for any question to be raised at an ordinary meeting—when the number of members present would probably be 10 times as many as at an extraordinary general meeting. The report of the Council in May last mentioned that the committee appointed to consider the alterations required would shortly present its report, but otherwise threw no light on the subject.

We cannot but regard it as unfortunate that whenever the Council has an important matter of this kind in hand, it should be rushed through in a hurry; sometimes haste is justified, as in the case of the purchase of the Institution Building, but as a rule there is no such urgency. The effect of this procedure is to create an impression on the minds of many members either that the Council regards the submission of such questions to the judgment of the Institution as a mere formality, or that it wishes to avoid free and open discussion—which, in the case of a society whose members are so widely distributed, can only be carried on effectively in the columns of the technical Press—and therefore smuggles the resolution through by a process which can hardly be described as artless. The former view is no doubt the more correct, for there is an unquestionable tendency on the part of the Councils of the big Institutions to become autocratic in their methods, and to assume an air of infallibility equalled only by that of a modern British Cabinet; as though to say, "It is for us to think and act; for you, to admire and approve." But this is an attitude which inevitably leads to discontent and annoyance amongst the members, and eventually provokes rebellion. It seems to us, therefore, that the wiser course would have been to allow plenty of time for mature consideration of the new proposals, and thus avoid all occasion for adverse criticism.

The chief innovations proposed are the introduction of a "Licentiate" class, between Students and Associate Members; the broadening of the basis of admission to full membership, so as to embrace "persons of eminence" who are not electrical engineers, and other changes which, in our opinion, are likely to lower rather than to raise the standards of qualification; a general increase of subscriptions and entrance fees by 25 to 50 per cent.; the embodiment of regulations for professional conduct; and changes in the constitution of the Council, on which the Associates will now be represented. These and other modifications of the articles would provide abundant material for comment, had we space at command; and it will be seen, we think, that the changes are such as should have been placed before all the members at least a month or six weeks before they were called upon to vote on them.

Melbourne's Bold Policy.

Elsewhere in this issue we refer briefly to a drastic reduction in the charges for electricity at Melbourne (Vic.) which, on the recommendation of the Electric Light Committee, was unanimously adopted by the City Council.

The new charges, which came into force last month, are practically 25 per cent. less than the old ones, and on the basis of the year 1910-11, represent a sacrifice of £22,691 in revenue. But the Committee believes that the develop-

ment of the undertaking during the current year, together with the further increased demand which should certainly result from these reductions, and the consequent decreased cost of production per unit, warrant it in anticipating a substantial credit balance for the year 1912.

It is impossible not to admire the optimistic feeling of the Melbourne Council as to the future of its electrical undertaking, which appears to underlie such unanimity in voting; Melbourne deserves all success for adopting such a bold policy, even though—to English eyes—it may appear rather like sailing a little close to the wind.

Possibly Australian conditions differ from British ones, and the Australian civic representative may have more solid grounds for believing in the success of his own undertakings; even so, there is no doubt that the municipal authorities of this country would benefit their electrical undertakings in the end, if they could import a little more optimism into their business methods.

As an instance of the "wobbly" methods of management which undoubtedly hinder the progress of electricity undertakings in this country, one may mention the recent decision of the Brighton Council to rescind a resolution two months old, abolishing meter rents to flat-rate consumers, and making much-needed concessions in other directions; this would have entailed a loss of £1,200 a year in revenue, if no compensating advantages were derived from the change.

As things are, the electricity supply business in this country expands, in spite of the unenterprising policy which, with one or two notable exceptions, is adopted by the municipal and company owners concerned. What would this business amount to, and what would be its effect on the electrical manufacturing and contracting community if, for instance, similar development to that on the North-East Coast occurred generally?

We have the engineering ability and the consumers, while money can generally be found for a live business; we wait only for a little faith on the part of those controlling the electricity supply business.

The Trailer Car in London.

A matter of considerable interest to the numerous patrons of the L.C.C. tramways came up for discussion at the Council meeting on Tuesday. The question of using coupled cars or trailer cars on certain of the Council's tramway routes has been to the fore for some years, as a possible method of dealing with the enormous volume of morning and evening traffic, particularly, we believe, on the Tooting route.

As a result of negotiations with the Board of Trade and the Metropolitan Commissioner of Police, two self-propelled coupled cars were put into service, experimentally, on the Euston Road and Hampstead Heath route in January last, it being agreed that they should not be run between the hours of 10 a.m. and 5 p.m.

Subsequently, as the result of police action, the cars ceased running on February 1st, but further negotiations resulted in their being again put into service for a month, with greatly restricted hours of use. The Highways Committee states that the running of these cars was most satisfactory, but points out, what we should have thought would be obvious, even to the Board of Trade and police authorities, that an accurate opinion could not be formed from a limited trial under such conditions.

Further experience was needed: The Board of Trade and Commissioner were again approached and asked to agree to double-deck trailer cars being run on the Victoria Embankment to Tooting route, also to agree to smoking being permitted in one of the single-deck coupled cars, the only result being, however, an irrelevant reply from the Board agreeing to further experimental running, under the previous restrictions as to time, on the Hampstead Heath route, which, moreover, was followed at a later date by a letter from the Commissioner of Police, asserting his opinion "that no advantages are likely to accrue which would in any way compensate for the obstruction and dangers incidental to the use of trailer cars."

While the Commissioner's views are, no doubt, based on mature experience of general traffic conditions, it is a little difficult to understand why two tramway cars should be more obstructive than any of the other numerous coupled vehicles which make use of the streets—indeed, short of an actual trial under normal service conditions, it seems rather premature to come to any definite decision on a matter of such importance to the tramway administration. Under the circumstances, the Council is justified in asking Parliament for specific authority to run both coupled and trailer cars on its tramways; it appears to be the only way in which a fair trial of the system can be ensured. Assuming that the traffic conditions are what they are represented to be, the only alternative method of meeting them is the costly one of adding more routes, a proceeding which could not be justified on financial grounds, where workmen's cars are concerned.

Empire Wireless.

The *Evening Standard* of October 27th is informed that negotiations have been concluded between the Postmaster-General and the Marconi Co. for a "chain of wireless stations round the world," which will make Great Britain the only nation in the world independent of cable communication with any part of the globe; to provide against cables being cut in war time, or one or other of the stations destroyed by bombardment, it is intended that the installation at each station shall be of sufficient power to send messages some 3,000 miles, and beyond one or more intermediate stations.

We are also told that £1,500,000 is to be the cost of this chain, by which important State and commercial secrets are to pass at all times without fear of interruption. The Post Office is to take control and provide subsidies of £10,000 a year for each of the 25 stations proposed to be erected, or an annual payment of £250,000. This will be one-sixth of the capital cost of the chain! Is it to be purchased on the instalment plan? The charge per word, but only over a given distance, is to be 1d., and a revenue of no less than £600,000 a year is anticipated; as the annual outlay is estimated at £200,000, one cannot help asking why is the huge subsidy required when such profits are in sight? We are also told that the estimated traffic is to reach 15,000 words per diem per station, or a total of 136,700,000 words for the 25 stations, which, including service words (say one-third more), will equal 80,000,000 words a year. Truly there will be a Babel of confusion in the air, which makes one wonder what will become of other installations, which are jammed badly enough at present.

To add to what may be termed sky talking, an American contemporary states that the high-power stations at Cape Cod and Wellfleet eject Press words into space continuously and repeatedly without cessation, so that whosoever cares to pick them up may do so, and be enabled, by piecing various pages together, to have an intelligible record. This we can understand, although it is somewhat in the nature of a puzzle as to how the cost is met, or who pays for this work. But the transmission of some 180 million words a day to fixed destinations in the face of physical and atmospheric difficulties, which prevail for hours daily at some places, with the risk of interception by enemies, ships and other stations, at a cost which would complete the chain of Empire cables does not, if the particulars as published are correct, appeal to us as being the sound way to meet the urgent necessity of a secret and reliable means of communication under British control.

Mr. Charles Bright, in the *Daily Graphic* and other papers of October 28th, calls attention to the present position of affairs. He states that the prevention of monopoly is one of the legitimate functions of a Government, and if the cable system is drifting into a combination, the question of ownership is a good deal altered. We think, however, the position of the Pacific cable is sound, and we have on previous occasions dealt with the question of compilation of accounts, and demonstrated that the project has really shown a profit. But what we cannot understand is that critics of the enterprise should take exception to the payment of so-called deficits—which are really in the nature of traffic guarantees—while the payment of £250,000 in subsidies to a wireless company is applauded. There is not the slightest doubt that a traffic guarantee is a most businesslike way of supporting telegraphic undertakings.

SOME RECENT TECHNICAL DECISIONS.

[BY OUR LEGAL CONTRIBUTOR.]

It is well for those who have to do with the electrical industry in all its manifold branches to make themselves acquainted with the more important decisions of the Courts. The questions addressed to the Editors, and answered in the "Legal Query" column of the Review, show that there is a desire for up-to-date information in many quarters, and the queries range over a wide area which is by no means entirely covered by the law relating to electricity. It may be convenient to review some of the most important decisions of the legal year, many of which have been reported in these columns during the last 12 months.

Many property owners have to rely upon the street hydrant for a sufficient supply of water in case of fire. In premises where there is much inflammable material it is essential that water shall be available at once. To enable the position of the hydrant to be determined, when the hydrant cover is concealed by snow, &c., a plate is put upon an adjoining wall. If this plate is moved or incorrectly placed there may be a great delay, and the fire may assume serious proportions. Who, then, is liable? In one case (Dawson *v.* Bingley U.D.C., 27 T.L.R. 308) it appeared that in a road which had not been taken over by the local authority there was a fire plug, which, however, at the material time was buried in the earth to the depth of 6 in. This had not been done by, or with the knowledge of, the defendants. A plate with the letters and figures "F.P., 22 ft. 3 in.," had been put up in the road by the defendants (who were also the water authority), but the plate did not correctly indicate the position of the plug. A fire having broken out on the plaintiffs' premises, the fire brigade arrived, but owing to the difficulty of finding the exact position of the fire plug, the efforts of the brigade to extinguish the fire were considerably retarded, and the damage to the plaintiffs' property was largely increased. In an action by the plaintiffs to recover damages from the defendants for breach of duty, it was held that the putting up of the denoting plate with misleading directions thereon was an act of misfeasance, and as it had caused damage to the plaintiffs, the defendants were liable.

Although the doings of the motorist are frequently considered in courts of petty sessions, he is not often brought up to the High Court. It is material to notice, however, that in one case it was decided that a conviction for failing to have a back plate of a motor-car illuminated during the period prescribed by Article XI of the Motor Car (Registration and Licensing) Order, 1903, is a conviction for an offence in respect of which endorsement of the convicted person's licence is required by Sec. 4 of the Motor Car Act, 1903.

In relation to contracts for large works, one must not overlook the important principle which has been laid down by the Court of Appeal as to arbitration. In effect the Court has said: "Where there is a clause referring disputes to the engineer of one party, and the dispute relates to the conduct of the engineer, he will not be allowed to decide it." In Freeman *v.* Chester R.D.C. (1911), I.K.B. 783, a contractor brought an action to recover the price of certain works constructed for a local authority under a contract which provided for the reference of disputes thereunder to the engineer of the local authority. In answer to a summons to stay proceedings under Sec. 4 of the Arbitration Act, 1889, the contractor challenged the conduct of the engineer in relation to the works, the question in dispute being whether the engineer had not precluded himself by his own admissions from asserting that the works had not been completed to his satisfaction, and that the period of maintenance had not expired.

The Court of Appeal (Cozens-Hardy, M.R., and Buckley, L.J.), affirming the decision of Lush, J. (in the exercise of the jurisdiction conferred upon it by the Arbitration Act, 1889), refused to order the action to be stayed. The Master of the Rolls did this on the ground that the cross-examination of the engineer was essential to the proper determination of the dispute. Lord Justice Buckley said that, although, in his opinion, the evidence failed to show that the engineer had unfitted himself to act as arbitrator, yet the fact that one Judge of the Court of Appeal was not "satisfied that there was no sufficient reason why the matter should not be referred" was a ground upon which another judge of co-ordinate jurisdiction could concur in the view that the presence of a sufficient reason was not shown.

The principle that where there is a breach of contract, it is the duty of the injured party to reduce the damages as far as possible, is well illustrated in the case of British Westinghouse Electric and Manufacturing Co. *v.* Underground Electric Railways Co. of London (1911), I.K.B. 575. In that case it appeared that the Westinghouse Co., having contracted to supply certain electrical machinery to the railway company, delivered machines which failed to satisfy the conditions of the contract as to economy of working. The railway company accepted the machines, reserving their right to damages for breach of contract, and subsequently, in order to avoid the expense of the continued use of the machines, bought machines of another manufacturer, with which they replaced those of the Westinghouse Co. If the railway company had continued to use the Westinghouse machines, the loss which they would have suffered in consequence of the breach of contract, namely, the amount by which the cost of working the machines supplied during a period of years representing the normal life of a Westinghouse machine would have exceeded the cost of working machines constructed in accordance with the contract for the same period, would have represented a larger sum than the price paid for the substituted machines. It was held that as the substitution of the new machines went in mitigation of the damages consequent on the breach of contract, the railway company were entitled to recover from the Westinghouse Co. the price paid for the new machines; and none the less because those machines were so superior to those of the Westinghouse Co. that it would have been to the pecuniary advantage of the railway company to have effected the substitution at their own cost, even if the machines supplied had been in accordance with the contract.

There have been but few recent decisions under the Factory Act. In one of these the question arose as to what was "cleaning machinery." It appears that by Sec. 13 of the Factory and Workshop Act, 1901, it is enacted that a child must not be allowed to clean in any factory any part of the machinery whilst the machinery is in motion by the aid of steam, water or other mechanical power.

A child of 12 years was employed in removing partly by hand and partly by means of a stick, from the rollers and top board of a cap-spinning machine for spinning woollen yarn, certain fluff formed in the course of spinning. If this fluff was not removed the rollers would become choked and the process would stop. The fluff was not mere refuse, but had a saleable value, and was, in fact, sold. It was held that the child was "cleaning machinery" within the meaning of the enactment (Taylor *v.* Mark Dawson & Sons, Ltd.).

The extent of the provisions which require fencing was also discussed in Jackson *v.* Mulliner (1911), I.K.B., 546. It was there decided that Sec. 10 of the Factory and Workshop Act, 1901, which enacts with respect to the fencing of machinery in a factory, that "every hoist or teagle, and every fly-wheel directly connected with the steam or water or other mechanical power" must be securely fenced, applies to a hoist which is not connected with mechanical power.

Those who carry out large contracts are sometimes troubled by claims from local authorities for the payment of considerable sums in respect of damage done to the highways by extraordinary traffic. It was recently held that the amount which can be recovered under Sec. 23 of the Highways and Locomotives (Amendment) Act, 1878, as amended by Sec. 12 of the Locomotives Act, 1898, is the expense caused by the damage arising from the extraordinary traffic or excessive weight upon the highway, provided the damage has been such that it has caused extraordinary expense, and in order that the expense may be extraordinary within the meaning of the section, the highway rate of the district must be substantially increased by the damage so as to place an unfair burden upon the ratepayers.

The expression "highways in the neighbourhood" in the section means similar roads in a neighbourhood of a

similar character to that in which the road with the extraordinary traffic is situated. (Billericay Rural Council *v.* Poplar Union and Keeling.)

In the domain of patent law, the two following cases are important. On an application for revocation of a patent on the ground that the patented article or process is manufactured or carried on exclusively outside the United Kingdom, the Comptroller of Patents, in computing the extent to which the article or process for which the patent has been obtained is, within the meaning of Sec. 27, Sub.-Sec. I of the Patents and Designs Act, 1907, manufactured or carried on within the United Kingdom, ought not to inquire whether what has been done in the United Kingdom, is, or is not, in derogation of the patentee's rights under his patent, or to exclude from the computation what has been done by infringers of the patent in derogation of those rights. In the same case it was declared to be doubtful whether Sec. 27, Sub.-Sec. 2 of the Act does not render lawful everything done while the patent is revocable, although it would otherwise be an infringement. (In *re* Fiat Motors, Ltd., Application.)

In a later case it was held that in considering whether a patent ought to be revoked under Sec. 27 Sub.-Sec. I, of the Patents and Designs Act, 1907, on the ground that the "patented article or process is manufactured or carried on exclusively or mainly outside the United Kingdom," the Court is not bound to determine that at the precise moment when the petition was lodged, there was a manufacture of the patented article or a carrying on of the patented process. A temporary cessation of manufacture and a sale of stock in the meantime will not prevent the operation of the sub.-section, but where the manufacture and business are entirely and permanently stopped, the section will not apply merely because the remaining stock is sold after the business has come to an end. (In *re* Green's Application.)

ELECTRIC OPERATION OF GOLD DREDGES.

In the alluvial gold deposits a considerable amount of dredging is carried on for the purpose of removing the spoil containing the gold from beneath the surface of the water, and within recent years the crude and old-fashioned dredges previously employed have been replaced by modern machines calculated to materially reduce the cost of operation. In a good many cases electric power has been employed to facilitate the handling of the material, and by the courtesy of the Yuba Construction Co., of Marysville, California, we

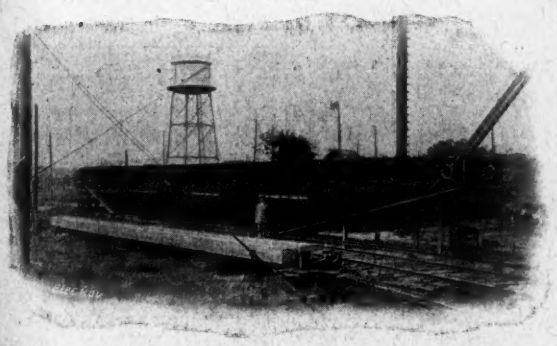


Fig. 1.—Dredger under Construction.

are able to describe and illustrate the electrical equipment of one of the largest gold dredges which has yet been built.

This boat, which is illustrated as it appeared in the course of construction in fig. 1 was built for the Yuba Consolidated Goldfields, and a few of the dimensions may be of interest. The hull itself is 155 ft. long, 68 ft. beam, and 12 ft. 6 in. deep. There is in the structure of the hull and housing something over 700,000 bd. ft. of timber, and the total weight of machinery and hull combined equals a displacement of 2,250 tons. The buckets have a capacity of 15 cb. ft. each, and there are 90 buckets in the line. The digging ladder is 135 ft. from centre to centre, of plate girder construction, 10 ft. deep in the middle, and of itself weighs 225,000 lb. The arrangement of the ladder and buckets is such that the boat will dig 65 ft. below the level

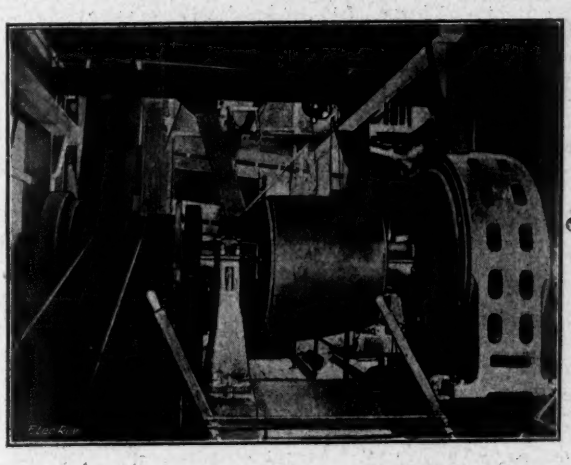


Fig. 2.—Digging Motor and Ladder Winch.

of the water in the pond on which it floats. The stacker ladder has 136 ft. centres, and the stacker conveyor belt is 42 in. wide, carried on the customary troughing idlers of the Robins type. The working capacity of this boat is approximately 300,000 yards per month.

It is rather a difficult matter to photograph the interior of a dredge, as the machinery is usually so crowded together that very little can usually be seen in a photograph except the immediate foreground and its contents. The illustrations, figs. 2 and 3, are, therefore, of peculiar interest as being taken under circumstances

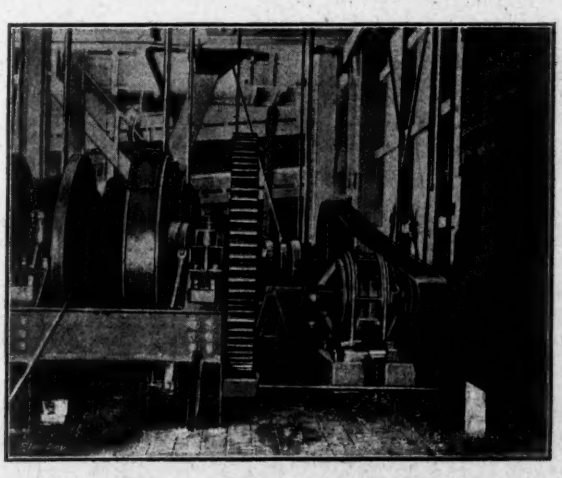


Fig. 3.—Main Winch and Motor.

of some difficulty. The former shows the digging motor connected with the ladder winch, and the counter shaft for the main drive, while the latter illustrates the motor connected with the main winch. The power for the operation of the motors is obtained from a high tension electric supply on shore by means of an armoured cable provided for the purpose, having a length of about 800 ft. On board the vessel the current is transformed to a suitable working pressure for the motors by three 200-kw., 4,000-volt primary to 460/230-volt secondary oil-cooled transformers. There is in addition a 10-kw. 4,000-volt to 230/115-volt oil-cooled transformer for lighting and auxiliary power. These transformers, together with the rest of the electrical equipment on board, were constructed by the General

Electric Co., of Schenectady. The switchboard consists of six 2 in. × 16 in. × 31 in. dull black slate panels, forming one complete switchboard 48 in. × 62 in., mounted on pipe supports 76 in. high. The panels are mounted with the usual voltmeters, ammeters and wattmeters, and are supplied with the latest type of remote control apparatus. The operation of this is controlled by a small type controller in the hands of the winchman. The main drive motor is a 300-H.P., 14-pole, 540-R.P.M. variable-speed induction motor, with an extra heavy duty reversible controller and resistance for continuous operation at from one-half to full speed. The motor is supplied with an outboard bearing and belt tightener rails. The winch motor is a 35-H.P., 12-pole, 600-R.P.M. constant-speed induction motor, with an extra heavy duty reversible controller and resistance for continuous operation at from half to full speed. There are three pump motors, the first of which, the high pressure pump, is operated by a 150-H.P., 12-pole, 600-R.P.M. constant-speed induction motor, with an oil-immersed starting compensator. The low pressure pump has a 75-H.P., 10-pole, 720-R.P.M. constant-speed induction motor with an oil-immersed starting compensator, while the auxiliary pump motor is driven by a 25-H.P., 6-pole 1,200-R.P.M. constant-speed induction motor. The screen is operated by a 75-H.P., 12-pole 600-R.P.M. constant-speed induction motor, while the stacker motor is of 60-H.P., of the 10-pole, 720-R.P.M. constant-speed induction type. In order to drive the tool-repairing equipment, a 2-H.P., 4-pole, 1,800-R.P.M. induction motor is installed. All these motors are suitable for 3-phase, 60 cycle, 440-volt current.

It has been found in previous experience that the motive power required for dredging plant has been frequently under-estimated, and the experience of the dredger builders mentioned, has shown that the main-drive motor particularly is at times very considerably over loaded. Where the ground is very hard it is necessary to install not less than a 400-H.P. motor for the main drive, and the motors mentioned above were selected as their size has been found to correspond more nearly with the actual requirements of such work. From the data given above a very good idea can be obtained of the important progress which electric power has made in this branch of industrial activity, and the application of electric power to gold dredging is, therefore, not without interest to British engineers.

CURING AN OILY COMMUTATOR.

By JOHN S. LEESE.

The escape of lubricating oil from the out-end bearing of the crankshaft of a four-cylinder vertical gas engine, direct-connected to a 100-KW. alternator, caused considerable annoyance in a plant over which the writer had supervision.

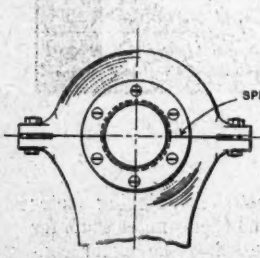


Fig. 1.

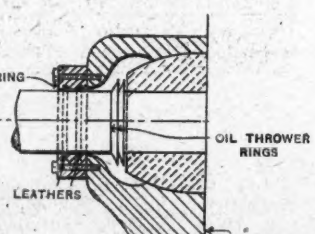


Fig. 2.

The journal was provided with forced-feed lubrication, the pressure being maintained by an oil pump driven by a small eccentric which was bolted to the extreme end of the shaft, which was completely enclosed by an oil-tight cover. Two oil-throwing rings were turned on the shaft at the inner end of the bearing, and were of the usual V-type, but did not prevent slight films of oil from creeping over them, along the shaft and on to the commutator, over which they spread with consequent trouble. A temporary experimental wiper gear was fixed up on the shaft between the out-end bearing and the commutator, consisting of a piece of old leather belting surrounding the shaft. After the commutator had been cleaned and the set run for a week with the wiper in place, no further accumulation of oil had manifested itself on the commutator or upon the shaft beyond the wiper, although quite a quantity was soaked up and dammed back by the leather.

To make this cure a fixture a cast-iron ring was turned, bored, faced and provided with two $\frac{1}{4}$-in. grooves on its inside periphery, after which it was split, as shown in fig. 3. In each groove was fitted a length of $\frac{1}{4}$-in. square raw-hide leather. The halves of the ring were then provided with

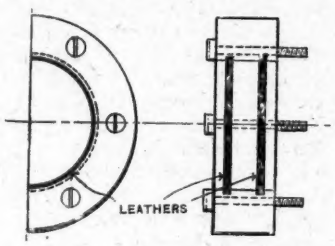


Fig. 3.

holes for three cheese-headed screws in each, which latter were tapped into the out-end bearing cap and pedestal bottom brass bed, as indicated in figs. 1 and 2. The device is shown fixed in position in these views, whilst fig. 3 shows half the ring with the screws and leathers in place. Perfect success attended this effort, and no more oily deposits have occurred on the commutator.

VENTILATION OF ARMATURES.

By W. H. F. MURDOCH, B.Sc., M.I.E.E.

The question of ventilation of armatures being of importance to electrical engineers, it might well be considered, from an electrical point of view, as indicated by Prof. W. N. Shaw, F.R.S., in his book, "Air Currents and the Laws of Ventilation."

With armatures the chief cause of resistance to the flow of air C is the resistance due to eddies, &c., the surface resistance being negligible in comparison with it.

If A is the aeromotive force, then —

$$C^2 = A/R,$$

since here the aeromotive force varies with the square of the air current, instead of directly, as in electrical circuits. When an armature arranged with radial ventilating ducts is

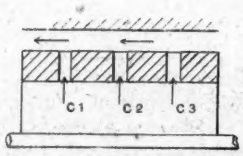


Fig. 1.

inside its casing, its section might, as a first approximation, be regarded as a channel with ducts opening into it, as in fig. 1. This figure represents the top of an armature with radial ventilating ducts.

If such an armature was at rest, and a fan was arranged to draw air through the ducts, it is at once apparent, as is pointed out in the above book referring to ventilating shafts, that a large quantity of air goes through the first duct, less through the second, and so on. If the resistances were assumed equal in all parts of the air circuit, then one-half goes through the first duct, one-quarter through the second, one-eighth through the third duct.

Now, when the armature revolves, each of these ducts has an aeromotive force of its own (see "Ventilation of Elec-

tricity Machinery "), causing a flow into the space between the armature and the frame, so that the electrical analogue is somewhat like fig. 2.

The resistance due to changing the direction of air in the passage is r in each case, and is assumed the same as in the ducts, since very little is known at present about it. The battery represents the aeromotive force in each case in the ducts. It is clear that the air current in the first branch is given by —

$$C_1^2 = a/2\ r.$$

In the second—

$$C_2^2 = a/3\ r, \text{ and so on.}$$

Consequently the ducts produce less effect the farther they are away from the exit. That being so, their resistance ought to be modified by increasing the area or by giving

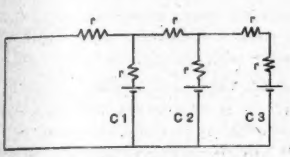


Fig. 2.

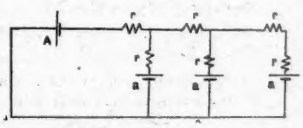


Fig. 3.

them increased aeromotive force. If the air is allowed to escape at both sides, as it usually is in the open-type machines, the ventilating action of the ducts will be more effective, since they are nearer the exit.

When a fan is allowed to draw air through the revolving armature, the electrical analogue is like fig. 3. Calling all the resistances r in this case, a the aeromotive forces in the ducts, and A the aeromotive force in the fan, we have for the flow in the first duct—

$$C_1^2 = A + a/2\ r,$$
$$C_2^2 = A + a/3\ r, \text{ and so on.}$$

We see, therefore, that the flow in the ducts is in the same ratio as previously, and gets less as the ducts are farther away from the fan, but is greater in the ratio—

$$A/a + 1.$$

Side openings in the frame may produce very deleterious effects unless care is taken. For instance, take the last example considered, but with ventilating openings opposite each armature duct having negligible resistance, see figs. 4 and 5.

Apply Kirchoff's Law, viz.: "The product of the currents into the resistances in any mesh of a network is equal to the sum of the electromotive forces."

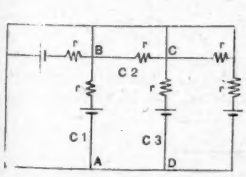


Fig. 4.

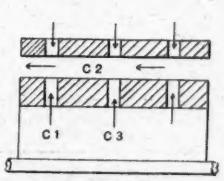


Fig. 5.

In this case the currents are squared and the aeromotive forces are to be considered.

Going round the mesh A B C D we have—

$$C_1^2 r - (C_1 - (C_2 + C_3))^2 r - C_3^2 r = a - a,$$

a and a being the aeromotive forces in the ducts. Simplifying—

$$2\ C_1 - (C_2 + C_3) - \frac{C_3^2}{C_2 + C_3} = 0.$$

If C_3 is regarded as small compared with C_2 then— $2\ C_1 = C_2$, or C_1 the flow in the first duct is half C_2, the flow in the channel. Again, if $C_3 = C_1$ we have—

$$2\ C_1\ C_2 - 2\ C_1\ C_2 + 2\ C_1^2 - 2\ C_1^2 - C_2^2 = 0, \text{ or } C_2 = 0.$$

Hence in this case there would be no flow of air in the channel and no ventilation there. The flow through the ducts would probably be increased owing to the diminution of resistance, but this would have little effect on the armature, the conductivity for heat *across* the laminations being very low indeed.

It seems to the author that the time has arrived to consider very carefully the effect of making openings in the frames, &c., of dynamos and motors. Just as in electric circuits, so in the air circuit, one may find that the fan or other source of aeromotive force is short-circuited and the ventilation very bad. At present the knowledge of ventilation of electrical machinery appears to be in a crude state.

NOTES FROM INDIA.

[FROM OUR SPECIAL CORRESPONDENT.]

Calcutta.—In view of the visit of the King and Queen to this city, the Imperial Government has, through the newspapers, made known its intention to carry out a grand display of illumination on the night of January 8th. The citizens have been invited to co-operate, as far as possible, in the scheme of illumination, so that it may present a harmonious whole. As Calcutta intends to give its Royal guests a right royal welcome, the invitation of the Government is sure to be generously responded to, and, therefore, home illumination strip and lamp makers and general accessory suppliers should be on the look out for large demands on their stocks. The Calcutta Supply Co.'s voltage to consumers is 225, but at this pressure metal lamps are, for obvious reasons, not popular for temporary work; it is likely, therefore, that carbon lamps will be more in demand. There should be large stocks of these after the Coronation at home, and those who have quantities to spare, and who wish to dispose of them at a low rate, should advertise the fact.

Bombay.—There is also to be a generous illumination of the city and public buildings here for the Royal visit in December, but as no official notification has been issued as yet, the display is not likely to be so lavish as that of Calcutta. Moreover, the Parsees, who compose the greater bulk of the middle class and wealthy inhabitants, are not nearly so fond of candle-power shows as the Hindu or Mussulman, although their loyalty to their King and country is none the less thorough on that account.

The new Bombay Post Office installation is almost completed. This was a large Government contract given away, report says, without being put to open tender; this, if it be correct, is to say the least, very irregular, and may be the cause of great dissatisfaction among local contractors.

Bombay Government House installation appears to be having an overhauling for the King's visit. It seems a pity that the general effect of the beautiful grounds should be marred by a mass of overhead wires jumbled together on poles which are awry and unsightly; particularly as the peninsula on which the Governor's town residence is built, is one of Nature's loveliest spots on the West Coast of India.

The Bombay Hydro-Electric Co. have their offices on Hornby Road, and their chief engineer, Mr. Gibbs, has made this address his headquarters for the present. There is every reason to anticipate that Bombay will one day soon be proud of her mighty hydro-electric scheme, because of its utility, its promise of cheap energy, its magnitude, and not least, because of the grandeur of its conception by one of her foremost citizens.

The contract for the electrical plant for this big installation has, it is reported, been given to Messrs. Siemens Bros. Dynamo Works Co., and that for the hydraulic plant to Messrs. Escher, Wyss & Co., but the contract for overhead mains and poles has not been decided upon yet. As the electric plant has gone to England, and the turbines to the Continent, the overhead gear will probably go to America.

Hindu Temple Lighting.—To the orthodox Hindu an apparently daring experiment has taken place at the sacred Temple of Kali, at Calcutta. The local *Statesman* calls it, at first sight, an incongruous innovation, but it goes on to remark, "if, after all, pilgrims journey to the Temple by electric tram, the lighting of the Temple by electricity is but

a logical development, and shows how readily Hinduism accommodates itself to modern conditions." It is but a few years since an electrical installation was put in at the Juggernaut Temple in Puri; but, unfortunately, cholera broke out amongst the pilgrims very shortly after, and the *pundits* and local Brahmins, attributing this outbreak to the anger of the god for having his sanctity invaded by the European, caused the whole equipment to be dismantled forthwith.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

Characters for Workmen.

I read with interest an article in your issue of 13th inst. on "The Burden of Giving a Character." I have no sympathy with the man who uses, or the employer who gives, a false character, as neither has much principle. I do not believe in a man being barred from securing a situation because he has done wrong (perhaps only once), as that might only drive men further into crime. If employers were forced to give a written character to employés leaving their service, together with the reason for leaving, a more satisfactory state of things might exist. In July last I received notice to leave my situation on a railway. I had been there eight years, and as the situation is a permanent one, I inquired the reason, and at the same time asked for a reference. I was told to refer any prospective employers to him (the chief engineer), and he would give me a good reference. I have now had nearly three months out of a situation. I have answered dozens of advertisements, and some have written for my last reference, and then I have heard no more. I have some employers' references, and could get dozens of references as to personal character from ministers, Church stewards and others, and yet the fact of having no reference from a place I was at eight years, hangs like a millstone on my neck. This same employer, A, would not give a written reference to a man who had been 10 years in his employ, and was sailing for Australia. It is time something was done in this matter.

Reformer.

The Demand for Technical Men.

In answer to Mr. Beckwith's letter, I should be pleased if he can tell me why firms do not advertise and offer a decent salary, if they are really short of good practical technical men?

I quite agree that the majority of B.Sc.'s are only worth about 30s., because I have found that the man who has taken high degrees has usually become such a bookworm that he has lost all his initiative, and has no confidence in himself, but if a man can obtain a high degree and retain his initiative, he usually proves a good man.

Surely it is too early for the Brush Co. to cry out about not being able to get competent men. During the last 15 years, hundreds of pupils must have passed through their hands, and if out of that number they have been unable to find sufficient good men to supply their works, then it does not say much for their system of training. I dare say their system is good, therefore they must know dozens of good men themselves, and could get them if they would only pay sufficient, but I dare say they want to retain the smartest men at 30s. to 40s. per week.

I suppose when Mr. Beckwith speaks of practical, theoretical men, he means men who have thoroughly mastered the first principles, without necessarily passing any examinations, and then improved their knowledge by taking a keen interest in their work and studying the technical papers, not text-books; and I maintain that if any firm require such a man, either in works or central station, and offer a reasonable salary, they will have at least a dozen capable men to choose from.

Until firms do advertise, you may be quite certain that they have all the men they require. If they cannot get the type of man they want at 30s. they will offer more, but they have found them very cheap so far. The Brush Co. are short of pupils; therefore they advertise.

Aving Sum.

Everybody desires more than he possesses, and especially anything that can be provided for him by means of pence collected from the general public. By taking advantage of this human trait, men combine to produce technical colleges, &c., and get themselves and friends appointed presidents and professors at big salaries. It is the only way they have of getting money more or less honestly. The education given is often as useful to a young man, as regular apprenticeship or indentures. I believe I am not the only one who has been employed in works where a parent gained an action against the employer, by reason of the paucity and monotonous character of the work of the firm, which was ordered to place the pupil with another firm at their own expense. But whatever facilities there may be for education, it is as sensible to expect that a good blacksmith who is always busy, will make a delicate wood engraver, as that mere labourers who can do a thing well if they are shown what to do, will be men who understand how and why the thing is done, can improve upon it, or the methods of doing it and instruct boys to do it, so that they can be themselves dispensed with. If employers want co-operation of theoretical and practical work, and its union in one man or girl at a wage of, say, 25s. a week, they will get and deserve mediocrity. Even if their profits increase, and they are saved the trouble of managing their business for a time, they will probably find change or bankruptcy necessary later on. A college as well as a practical workshop education is doubtless as necessary for employers, managers and designing draughtsmen, as it is to keep themselves up to date by studying the ELECTRICAL REVIEW, but how many managers and draughtsmen are required to supply the United Kingdom?

Edward D. Hearn.

Derby, *October 27th*, 1911.

LEGAL.

L.C.C. TRAM ACCIDENT.

A COMMON JURY in Mr. Justice Bucknill's Court in the King's Bench Division on Thursday, October 26th, awarded a working man £50 as damages for injuries sustained by being knocked down by one of the L.C.C.'s electric tramcars in March of last year. The plaintiff, a man named Munns, was crossing the Holloway Road at 11.30 on a Saturday night, when, according to his account, the car struck him without having given any warning of its approach, but the evidence on the point was very conflicting, the L.C.C. witnesses stating that the man ran against the back part of the car, and was thrown down in consequence. The injuries were not very severe, and judgment was entered for him, with costs, in accordance with the jury's finding.

THE HYTHE TELEPHONE DISPUTE.

IN the Chancery Division on Friday, October 27th, before Mr. Justice Swinfen Eady, Mr. Frank Russell, K.C., with whom was Mr. Cann, said he had a motion in the action of Dickens *v.* the National Telephone Co., Ltd., against the company seeking to restrain them from cutting off wires at Hythe. His Lordship gave him leave to serve short notice of motion on the company. The affair was urgent, but he understood that counsel for the company wanted time to answer the plaintiff's affidavit.

MR. PERCY WHEELER appeared for the company, and said that he had only received the plaintiff's affidavit within the last hour, and he had not had an opportunity of answering it.

His LORDSHIP: When is it proposed to sever the communication?

MR. RUSSELL: At once. I was going on to say that, unless my friend will give me an undertaking for a week not to sever communication during the week, I shall have to move now.

MR. WHEELER said he was quite willing to give an undertaking on these terms.

His LORDSHIP: What is the nature of the dispute?

MR. WHEELER said the nature of the dispute was whether certain wayleaves which had been granted to the company were to be continued or not. He was quite willing to give an undertaking in the terms of the notice of motion, not to cut, disconnect, remove, or otherwise interfere with any wire or line connected

with the plaintiff's premises. He was bound to add, however, the qualification "unless I am compelled to do so by the owner of any land whereon any post is standing."

His Lordship: An owner cannot compel you except by judicial process. I think there ought to be an absolute injunction with liberty to you to apply.

Mr. Russell said he could not accept the qualified undertaking.

Mr. Percy Wheeler said the Telephone Co. owned posts put up on other people's land under a licence, which the owner of the land might revoke at any time. He (counsel) only wanted to safeguard himself.

His Lordship: I will safeguard you by giving you leave to apply if circumstances rendering it necessary should arise.

The undertaking in the terms of the notice of motion was then given and accepted, and his Lordship allowed the motion to stand for a week.

A Fife Tramway Claim.

Sheriff Armour Hannay, at Cupar on Thursday last week, awarded £112 to a Methil butcher in an action against the Wemyss and District Tramway Co. Pursuer's case was that he was driving along the road and could not get off the track in consequence of his van wheels skidding on the tramway rails. There was a collision in which he was injured. For the company it was contended that pursuer ran into the car.

AUTOMATIC AERIAL ROPEWAY AT BURSLEM DESTRUCTOR WORKS.

We illustrate herewith an interesting little ropeway installation for the automatic disposal of hot clinkers and ashes from the destructor works at Burslem, which was designed and erected by Messrs. R. White & Sons, engineers, of Widnes.

Hitherto it has been the practice for the men serving the furnace house of the destructor simply to rake out the clinkers into iron barrows and wheel them by hand on to the clinker tip, some 50 yards or so away from the destructor house.

Fig. 1.—Tip-box in Operation.

Fig. 2.—Return Tower.

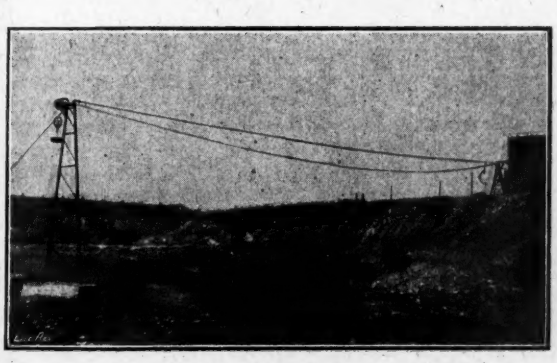


Fig. 3.—General View of Ropeway.

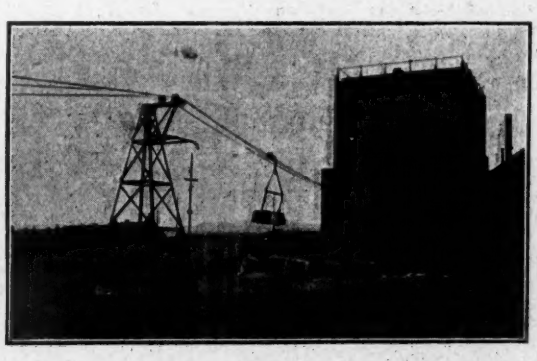


Fig. 4.—Standard and Destructor House.

The distance, however, is rapidly increasing, and latterly it has become a severe tax on the men to have to run out of the heated atmosphere of the furnace house, in all weathers, wet or cold, and take the ashes away; the installation we now describe saves all this and enables the men to remain under cover at all times.

58 ft. above the bottom ground level, and the height of the terminal standard at R is 35 ft., so that there is an average height of about 40 ft. provided for tipping the material and levelling up the ground to the top level as shown in fig. 5.

The ropeway consists of a single steel cable 1 in. in diameter, of locked-coil construction, along which the carrier travels backwards and forwards by means of the double hauling rope (shown in the view) to which it is attached.

This main cable is anchored to the wall with a screw anchorage, by which it can be tightened up when required, but owing to the locked-coil construction and absence of hemp core the "stretch" of the rope is practically nil. From here it passes over rope saddles of White's patent construction, which are supported by angle brackets bolted to the main uprights of the destructor, thence over the standard at S to the return tower R. Here it is bolted on to a special form of clamp which acts also as a rope saddle. Finally, it is connected to a ground anchor, with a screw tension thus forming a guy rope to the return terminal.

The hauling rope, which is spliced and endless, makes 2½ turns around the driving wheel, which is of the "fleeting" type with renewable segments on the tread.

From there it passes over suitable sheaves which are of White's special self-lubricating type, on to the standard S, to the end tower at R. Here it passes around sheaves, as shown in fig. 2, to one of which is attached a hanging weight, so that a constant tension is always put upon the rope to keep it up to its work. The rope then travels back over suitable sheaves to the fleeting wheel, but before finally arriving at this point, and joining on to itself, so to speak, the rope makes one turn around a wheel, which is connected by suitable gearing to a pointer working on a cast-iron box, which forms a protective cover around the gearing.

This pointer works on the top of a dial, which is marked out in figures corresponding to the length of the tipping ground, and is so arranged that, as the tipping proceeds, the length of run-out of the

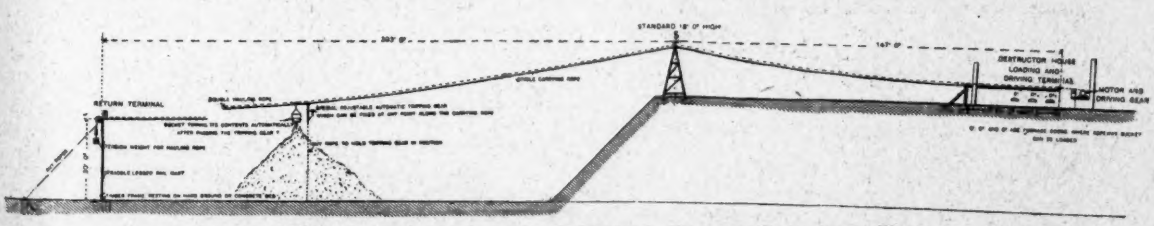


Fig. 5.—Diagram showing Lay-out of Ropeway, Burslem Destructor Works.

Fig. 5 is a line engraving showing the general lay-out of the ropeway, both inside and outside the destructor house, whilst fig. 3 is from a photograph of the same route. The destructor house itself is built on a bank, some 40 ft. above the normal ground level, and the whole of the bank from the destructor house to the first standard at S, has been made by the clinkers from the destructor. It will be seen how necessary it was to adopt mechanical means for the distribution of the ashes instead of manual labour.

The ropeway is 450 ft. long overall, and of this length 300 ft. is provided for tipping upon. The height of the standard at S is

carrier can be varied from time to time as required by putting the pointer over the figure representing the number of feet of run-out required. When this point is arrived at the pointer knocks over a switch lever and automatically stops the electric-motor driving the gear, thus making the arrangement quite automatic and independent of manual attention during the run-out.

On the tipping section of the main carrying rope an automatic tripper is provided, which is clearly shown in fig. 1, and is so arranged that as soon as the carrier, in its outward travel, arrives at this tripper, a lever on the carrier-box is knocked over and the box upsets, thus automatically throwing its contents on to the spoil heap without being touched by hand; fig. 1 shows the carrier automatically stopped, after tipping its contents, the smoke from which is clearly seen rising from the ground. Fig. 4 shows the same carrier on its way to the destructor house.

As tipping proceeds, and the bank is filled up to the required level, the automatic tripper is moved along the rope a few feet by slackening the two bolts clamping it to the rope. At the same time, the position of the pointer on the automatic cut-off gear is similarly altered, and tipping goes on in the fresh place, as before.

It will be understood that the *modus operandi* is as follows:—

The carrier being brought under the particular furnace from which the clinker is to be withdrawn (there are three such furnaces in this installation) is filled in the usual manner. The handle of the electric controller is moved over, and the loaded carrier travels forward without further attention. On arrival at the tripper the contents of the box are automatically tipped and, at the same moment, the carrier is automatically brought to a standstill, the box remaining upside down to keep out the weather whilst it is standing empty on the rope, until it is wanted again. In this case the reversing switch of the controller is moved over, when the carrier is again brought to its required position for loading its next load.

In practice the installation works exceedingly well, and is much appreciated by the men, relieving them, as it does, of one of their most arduous duties.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Oil-Immersed Starters for D.C. Motors.

A standard line of these starters has been developed by The Electric Construction Co., of Wolverhampton, for mining and factory use. They are of the slow-motion ratchet type, each

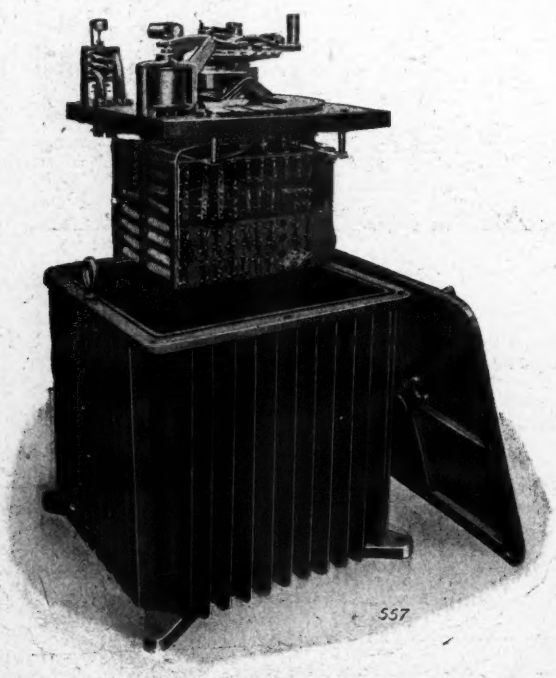


Fig. 1.—Oil-Immersed d.c. Starter, with Switch and Resistance removed from Tank.

stroke of the lever enabling the switch arm to be moved definitely and quickly one step at a time, so avoiding any hovering on the edges of the contacts which is the cause of so much destructive burning of the contacts in starters which are moved slowly. They are fitted with no-voltage, or no-voltage and overload releases, and the arrangement is such that it is impossible to get beyond the first contact should there be no voltage on the supply. Also, during the starting up operation, or when in the running position, the switch will release in the event of an overload or a no-voltage occurring, and it is impossible for the switch arm to be left on any position other than "off," or on the final contact with all resistance cut out, making the switch practically foolproof.

The starting switch is mounted on the top of a slate base which also carries the resistance coils on the underside. The whole is immersed in oil. Any arcing which may occur takes place under the level of the oil, and all contacts are protected from dust and are, therefore, maintained in a clean condition. The coils, being immersed in oil, have a large capacity for heat, and in the larger sizes the tank is provided with ribs to assist in the cooling of the oil.

A starting switch and coils can be removed from its case by the removal of four fixing screws and by withdrawing the cables. The terminals are raised from the slate above the level of the oil, so that the cables do not soak up the oil, and all contacts are renewable from the front of the slate. Starters without ratchet gear are also supplied, but only in the smaller sizes.

"Blo" Electric Hot-Air Douche.

The Sanitas Electrical Co., Ltd., of 61, New Cavendish Street, London, W., have just brought out an ingenious little appliance, the "Blo" hot-air douche, for producing a stream of hot air immediately. It consists of a small electric motor, which drives a rapidly revolving fan, combined with a heating apparatus. The whole is so designed and put together that it never requires oiling. The heating body, which is placed in the projecting tube, consists of a fine wire wound round a porcelain cylinder, constructed so that every part of the heater is continuously and evenly cooled by the air current produced by the fan. This makes the heater practically indestructible, but should it burn out, it can be changed in a few seconds without any tools. This clever combination renders it possible to obtain a very strong current of hot air immediately on connecting the "Blo" to any ordinary wall-socket or lampholder of the electric light mains. It is possible to regulate the heat by simply moving the "Blo" further from the object being warmed.

Fig. 2.—Electric Hot-Air Douche.

A triple switch is fitted to the "Blo," and on turning this switch to the right the motor at once starts rotating, and likewise the fan; in this way a stream of cold air is derived. By turning the switch again to the right the heating body is switched in, and a very strong and constant stream of hot air is then instantly obtained. A further turn of the switch to the right stops the motor and also switches off the current from the heating body.

The "Blo" is manufactured in aluminium, and weighs only 2 lb. The consumption of power is low, and the expense of running it practically nil. Another pattern is made which can be used on all voltages from 100 to 250 volts, by inserting suitable resistance lamps in circuit with the motor and using a suitable heater.

The N.P.U. Circuit-Breaker.

Messrs. Nalder Bros. & Thompson, Ltd., of 34, Queen Street, E.C., have just placed upon the market a circuit-breaker which attracted a good deal of attention at their stand at Olympia. It is extremely neat and compact in design and of particularly robust construction; it is fitted with magnetic blow-out and loose handle, but carbon breaks can be supplied if preferred, and the breaker can be supplied in various forms, either as an over-load with or without time limit, reverse current, or over-load and reverse current breaker combined.

The tripping mechanism has received particular attention in design, and is entirely novel; it possesses the advantage of being extremely light to trip, so that there is no element of uncertainty. The effort required to release the breaker is very small, and at the

same time there is not the slightest possibility of its opening accidentally.

Being of the loose-handle type, it cannot be replaced while the over-load is still on ; it can be tripped by hand, and therefore combines the properties of a circuit-breaker with the advantages of a switch.

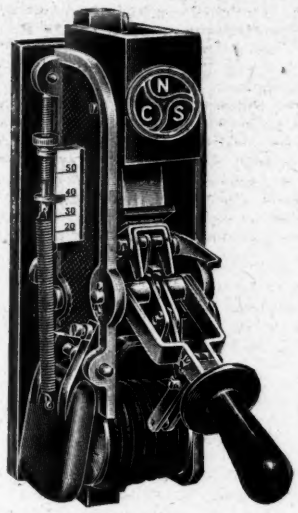


Fig. 3.—N.P.U. Circuit-Breaker.

Its appearance is shown in the accompanying illustration, fig. 3.

BUSINESS NOTES.

Book Notices.—"List of Officers and Members of the Institution of Electrical Engineers." "*Journal* of the Institution," September, 1911, with Index to Vol. 47, 1911. London : E. & F. N. Spon, Ltd. Price 5s. net.—The issue for September contains the following papers :—"The Driving of Winding Engines by Induction Motors," by H. J. S. Heather ; "Automatic Telephone Exchange Systems," by W. Aitken ; "The Heating of Cables with Current," by S. W. Melsom and H. C. Booth ; "A Power Company's Testing Department," by E. Fawsett ; "The Magnetic Properties of Manganese Steels," by E. Griffiths ; "Single-Phase Commutator Motors," by G. W. P. Page and G. J. Scott ; "Dry-Core Lead-Covered Telephone Cables," by H. C. May ; "Electric Locomotives and High-Tension Direct-Current Railways," by A. Monkhouse : "Exhaust Steam Turbines," by R. C. Plowman and E. F. Hetherington ; "Manufacturing Costs," by A. R. Stelling ; "Electric Traction on Main Lines in Europe," by J. B. Sparks.

Metric Equivalent Tables. London : The Central Translations Institute. Price 6d. net.—This handy sheet of 50 useful tables, which are very compact in form, provides for the entire range of equivalents that are likely to arise in commercial dealings between this country and countries using the metric weights and measures. The calculations are based upon figures supplied by the Board of Trade, and are guaranteed to be absolutely accurate. The price equivalents deal with feet, yards, square feet, square yards, cubic feet, gallons, lb. (av.), cwt. and 40 cb. ft. measurement (useful for checking freight charges). The prices are calculated at the par rate of exchange—25.22 fr. to the £.

Gas Works Directory and Statistics, 1911-12. London : Hazell, Watson & Viney, Ltd., 10s. 6d. net.—This is the thirty-fourth edition of a work which, while undoubtedly indispensable to those concerned with the extensive gas supply undertakings and industry of the country, is also of some service to engineers interested in electricity supply, who may desire to know the gas conditions prevailing in any particular town in which they may contemplate operations. At foot of the gas information there is given a note indicating whether, and if so, by whom, electric supply is provided.

Water-Works Directory and Statistics for 1911-12. London : Hazell, Watson & Viney, Ltd. 10s. 6d. net.—This is a book very similar in its arrangement to the one referred to above. The various cities and towns are placed alphabetically, the authority, capital expenditure, population, date of works, death rate, output of water, system of filtration, scale of charges, names of officials, and a good deal of other information being given.

Table of Equivalents.—A useful table has been issued by Rosenblum's Translation Bureau, which enables any English, metric or Russian measure and weight, and the money of any country, with their equivalents, to be easily found in alphabetical order.

We have received a copy of a special "Railway Number" of the *National Review (China)*, a paper which is published in China. It contains a great deal of information which should be of interest to most people when all eyes are turned to the Far East, watching the course of the rebellion of the people against the Manchu Dynasty Its various articles, and the map of Chinese railways (constructed, constructing and projected), should, however, possess far greater interest and real value to firms in this country who are anxious to secure a share of the business that must be given out to foreign countries as the Chinese people move on toward modernisation as the result of the Westernising movement of recent years. The *Review* can be obtained (2s., post free) from the London agents : The Far Eastern Advertising Agency, Ltd., Craven House, Kingsway, W.C.

"*Bulletin* of the Association des Ingenieurs Electriciens," June-July, 1911. Brussels : The Association. Price 8 fr.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXX, No. 10. October, 1911. New York : The Institute : Price $1.

"Small Switches, &c., and their Circuits." By W. Perren Maycock. 1911. London : S. Rentell & Co. Price 2s. 6d. net.

"Electrical Engineering." By Harold H. Simmons, M.I.E.E. Part I. London : Cassell & Co. Price 7d. net.

"Revue de l'Ingenieur et Index Technique." October, 1911. Brussels ; L'Institut Technique Industriel. Price 2.50 fr.

"*Journal* of the Franklin Institute." Vol. CLXXII, No. 4. October, 1911. Philadelphia : The Institute. Price 50 cents.

"Annales des Postes, Télégraphes et Téléphones" and "Formules Relatives aux Lignes Telegraphiques et a la Propagation du Courant," by M. Pomey. September, 1911. Paris : A. Dumas. Price 6 fr.

"Revue d'Electricité." Vol. XXVIII, No. 9. September, 1911. Brussels : Societe Belge d'Electriciens. Price 1.75 fr.

"Il Nuovo Cimento." October, 1911. Pisa : Societa Italiana di Fisica.

"Steam Turbine Design." By John Morrow. 1911. London : Edward Arnold. Price 16s. net.

"*Mechanical World* Pocket Diary and Year-Book for 1912." Manchester : Emmott & Co., Ltd. Price 6d. net.

"Fifteen Fiscal Fallacies." By G. W. Gough, B.A., F.S.S. London : Free Trade Union. 6d.

Opera House Electric Fittings.—For the new Opera House in Kingsway which is about to be opened, the whole of the electric fittings have been supplied by Messrs. Veritys, Ltd., against open competition. The contract was one of the largest of its kind placed in London for theatre installations. The fittings were expressly designed by the firm's own designers to harmonise with the interior architectural details and scheme of decoration, which is modern French Renaissance. There are a number of fittings in the various departments unobtrusively harmonising with the general scheme, these being cut-glass bowl fixtures with cast ornamental bands, finished in gilt, but the principal piece of work is a large centre light, believed to be one of the largest in Great Britain. It measures 9 ft. in diameter × 5 ft. deep, and is composed of crystal cut-glass panels, and when the 150 lights are "on," the effect should be very fine. It can be raised or lowered by a special winch, and one of its chief features is that if the glass be accidentally broken, it cannot fall. The fitting has 10 panels with a dish at the bottom. Each panel is enriched with deeply cut laurel festoons in the French style.

Hotel Installation.—Messrs. Osborne & Hunter, of Glasgow, have carried out the electric lighting, ventilation, &c., of the "Highland" Hotel, Strathpeffer.

Metallic-Filament Lamps—Price Reduction.—The Electric and Ordnance Accessories Co., Ltd., inform us that they are reducing the prices of their metal-filament lamps of voltages from 50 to 260, in accordance with a leaflet which they have just issued.

Turin Exhibition Award.—Messrs. R. Wolf, of 7, Laurence Pountney Hill, E.C., inform us that they gained three Grands Prix for their exhibits of superheated steam locomobiles and other machinery.

Private Meeting.—The Davis Electrical Co., Ltd., 17, Moor Street, Cambridge Circus, W.—A meeting of the creditors convened by the liquidator, Mr. G. Corfield, in pursuance of the Companies (Consolidation) Act, was held on Monday, October 23rd, at Armfields Hotel, Finsbury, E.C. Mr. Corfield presided, and explained that he had been appointed liquidator on the 6th October, at a meeting of the shareholders of the company, and he had since prepared a statement of affairs showing the company's position as at that date. The trade creditors amounted to £2,856, and liabilities on bills £447, making total unsecured liabilities £3,333. There were two series of debentures, the first for £2,000, £1,000 of which was issued to Mr. Davis in part payment of the purchase money of the business, and the other £1,000 to Mr. Levy for cash advanced. The second series amounted to £1,110, and were issued £600 to Mr. Levy for cash advanced in April and May last, and £500 issued to Mr. Davis in respect of advances and arrears of salary. On these debentures there was £213 owing for interest, making the total claims of the debenture-holders £3,317. The total assets of the company, including stock, £1,735, fixtures, book debts, &c, amounted to £2,886, showing a deficiency of £427 on the debentures. There were no assets available for creditors. The share capital of the company was £1,000 issued, so that with the above deficiency, and the amount due to creditors, the total deficiency was £4,786. The company was registered on October 2nd, 1908, and Mr. Davis, as director, was entitled to draw £500 a year salary, and Mr. Howlett £3 10s. a week. They had continued to draw these sums down to the date of the liquidator's appointment. The company had never made any profit. The only shareholders were Mr. Davis and Mr. Howlett. In the course of

the discussion which followed, creditors drew attention to the issue of debentures to Mr. Davis in respect of arrears of salary, and said it was a most extraordinary proceeding, having regard to the fact that he personally was all the time making favourable representations as to the position of the company, in order to obtain credit. In reply to questions, the liquidator said the company had continued to obtain goods right up to the end of September, but creditors stated that goods had been obtained as late as October 2nd. Some time after the solicitor had been consulted as to the affairs of the company, creditors generally expressed dissatisfaction at the conduct of Mr. Davis, who, they considered, had simply been increasing the value of his debentures at the expense of the creditors. They were, therefore, not prepared to accept the voluntary liquidation, but would propose that the company should be forced into compulsory liquidation. Mr. Corfield said before that step was taken there was a proposal which might render such a course unnecessary. He was instructed that if a committee of creditors was appointed, and the meeting adjourned for the purpose of allowing that committee to consult with Mr. Davis and his father-in-law, Mr. Levy, there was a possibility of some offer being made to the creditors by way of composition. After some further discussion, and without prejudice to the position of the creditors, a resolution was passed appointing a committee of the five largest creditors to confer as to the best course to be pursued in the interests of the unsecured creditors, and that the meeting stand adjourned for 14 days. The committee appointed consisted of Mr. Louis, of the Electrical Co.; Mr. Rook, of the Sloan Electrical Co.; and representatives of Messrs. Johnson & Phillips, McDougall & Co., Ltd., and the Wolfram Lamp Co. The following are the creditors:—

Wittuson, H., & Co.	£15	London Com. Elec. Stores	£52
Associated Battery Co.	20	Credenda Conduit Co.	86
Baxter & Caunter	17	Marsh, Son & Co.	31
B.T.-H. Co.	17	Kingolite Co.	40
Thorwerth Agent, Carl	67	Hunter Electric Co.	26
Fisher & Ludlow, Ltd.	121	Deutsche Gesellschaft	153
Kremenaky, Joh., Vienna	116	Radium Electric Co.	16
Electrical Co.	302	Schoen Bros.	32
Electric and Ordnance Co.	21	Sloan Electrical Co.	58
Conradty Co.	312	Siemens Bros. & Co.	142
General Electric Co.	29	Simplex Steel Tube Co.	26
Wardle Eng. Co.	15	Tucker, J. H.	17
Brown Patent Syndicate	15	Turner & Berger	40
Heatley-Gresham Eng. Co.	94	Union Electric Co.	27
Holophane Glass Co.	18	McDougall, Ltd., James	479
Kruger & Friedeburg, Berlin	57	Wolfram Lamp Co., Augsburg	78
Johnson & Phillips, Ltd.	150	" " "	41
General Accessories Co.	28	Goossens, Pope & Co.	23
Gent & Co.	15		

Zoelly Marine Turbines.—MESSRS. ESCHER, WYSS state that owing to the excellent results obtained with the torpedo-boat destroyers *Warrington* and *Mayrant*, both fitted with Zoelly turbines of 13,000 S.H.P., and built at Messrs. Cramp's Yard in Philadelphia, for the U.S. Navy, the latter have placed an order with the same firm for other four torpedo-boats fitted with Zoelly turbines. The turbines of each vessel are designed for 16,000 S.H.P.

Roumania.—On the prospects of trade in Roumania, the *Zeitschrift für Elektrotechnik und Maschinenbau* says:—As a minor market for electrical machinery and apparatus Roumania is deserving of attention. The imports comprise dynamos, motors, switches, inductors, dynamo accessories, accumulators and renewal plates, lighting apparatus, telegraph and telephone material, light and power lines, bells, electro-medical batteries, fuses and other electric accessories, single current cables, also armoured cable, both insulated and non-insulated. It is obviously difficult, if not impossible, to fix a price basis for the articles named, as their kind and quality are almost endless. The bulk of the supplies for Roumanian consumption is furnished by German, Austrian and Hungarian manufacturers, only a small portion coming from French, Belgian and English special firms. German and Austro-Hungarian firms have their own branches at Bucharest, and the others at least subsidise an agent, without whose co-operation the successful conduct of business is impossible. As competition is particularly keen among the firms named, local business heads are given the fullest powers with regard to outside prices, and especially where State or communal orders are under treaty. Private business usually depends more on the suitability of the price than on the quality of the goods or their manufacture, and under the present local circumstances helps to make State orders remunerative. With regard to the price of cable, the current quotation of copper naturally plays the chief rôle; and for accumulators the prices vary according to size and capacity. Leclanché cells for bell services, in which articles a considerable business may be done, are sold retail at 1 to 1·50 fr. Other patterns fetch 1·50 to 3 fr. Arc lamps fetch 100 to 175 fr. Similarly there is a considerable call for glow lamps, the price of which ranges according to candle-power, from 0·40 to 3 fr. each. The electric current in Bucharest and in the provincial towns is relatively dear, and in consequence lamps offering the best results find the readiest market. Their retail price, according to candle-power and quality, is 2·25 to 20 fr. each. For the past three years the use of fans has shown steady progress, and owing to the activity in building operations, and the more exacting sanitary regulations, they are assured of a good future. The quotation of these articles is from 200 to 400 fr.; table fans command from 75 to 200 fr. Silk cord, which has a big sale, is quoted according to appearance, quality and name at 3 to 5 fr. per kilog. As regards the Roumanian electrical industry, it is practically non-existent. The Administration of Posts, Telegraphs and Telephones in their works at Bucharest are the sole producers, and they make chiefly telephone apparatus. The principal electrical undertakings in Roumania are the following:—The Société Roumaine "Electrica," formerly Lahmeyer, founded in 1900; the modern light and power establishments of the petroleum area at Campina; the Bucharest electric undertaking, which belongs to the concessionaires of the Belgian Tramway Co.; the National Theatres generating station; the Bucharest Gas and Electric Co., which furnished the public lighting; the electric works at the docks at Braila, Galatz and Costanza; and the municipal generating stations of the principal towns—Craiova, Ploesti, Jassy, Costanza, Galatz, Braila and Berlad. The chief competing firms on the spot are:—The Allgemeine Electricitäts Gesellschaft, Berlin, which not long ago founded a Roumanian share company, and Siemens-Schuckert's Roumanian electrical company; these two firms are the oldest and best placed, and monopolise, so to say, the lion's share of all Government orders. Besides these, a new municipal electric company was formed about a year ago, which will from the spring of 1912 undertake the working of street tramways. The sustained progress of the native industries provides a steady stimulus to the trade in electrical goods, &c., and for the possession of this market Germany, Austria-Hungary and France are keen competitors.

Catalogues and Lists.—THE ST. HELENS CABLE AND RUBBER CO., LTD., Warrington.—Leaflet stating the advantages of their cab-tire sheathed cables for dangerous situations involving corrosion and hard wear, and quoting some extracts regarding same from our own pages.

THE ECLIPSE ELECTRIC CO., 77, St. John's Road, Bootle.—Illustrated lists giving particulars and prices of the Harvey electric vacuum cleaners, and the Whipple electric tire pump.

THE WALSALL ELECTRICAL CO., LTD., 57, Bridge Street, Walsall.—Several advanced leaflets of their switchboard catalogue containing illustrations and full particulars of prices of "Walsall" motor starting panels, voltmeter switches, battery auto cut-in and cut-out, fuses, cell regulating switches, knife switches and fuseboards. Copies can be obtained by any reader on application.

MESSRS. BAXENDALE & CO., LTD., Miller Street, Manchester.—80-page catalogue (No. 11,012) giving illustrations, prices and brief particulars of a great variety of electric light supplies (including lamps and lampholders, ceiling roses, main and ironclad switches and cut-outs, switch and fuseboards, wall connections, wires and cables, conduit and fittings, &c.).

MESSRS. FERRANTI, LTD., Hollinwood.—Very attractively produced brochure containing full particulars of the Ferranti electric heating and cooking apparatus, and stating prices of same. Electric irons, disk stoves, aluminium utensils, breakfast cookers, and some interesting and novel types of electric fires, are excellently illustrated.

THE EDISON & SWAN UNITED ELECTRIC LIGHT CO., LTD., 36 and 37, Queen Street, Cheapside, London, E.C.—Circular announcing reductions of prices of their "Royal Ediswan" metal-filament (tungsten) lamps, also introducing several new types in a smaller bulb than hitherto offered (standard bulb, 100-130 volts, 12 watts, approx. 9 British C.P., and 200-260 volts, 24 watts, approx. 16 British C.P.). In a new 8-page list just published the company show these and other new lines, the illustrations appearing two-thirds full size. Two additional types of fancy lamps in small round bulbs for use in special positions are also listed. Other lines included in this list are tubular lamps, olive-shaped lamps, "Huntalite" candle lamps, "Tubolite" lamps, and "Kingolite" candle fittings. Prices are very distinctly shown.

THE ELECTRICAL CO., LTD., 122-124, Charing Cross Road, London, W.C.—Pamphlet entitled "Sunshine after Sunset," wherein appear illustrated particulars of the "Sunshine" flame arc lamps, and spare parts, carbons, &c., for same, also projector arc lamps. A loose list of present stock of D.C. motors details their sizes, speeds and voltages.

THE GLOBE ELECTRIC CO., LTD., 11, Farringdon Avenue, London, E.C.—Leaflet No. S 82, showing and giving prices of their "Globe-o-lite" illuminated signs. These signs are made with solid glass spheres let into suitably formed perforations.

THE ESSEX ACCUMULATOR CO., 497 and 499, Grove Green Road, Leytonstone, London, N.E.—Twenty-four page catalogue containing descriptive information, illustrations and prices of the "De Luxe" car lighting sets, "Popular" car lighting sets, "Standard" type accumulators for motor cycle, motor car, and motor boat service, large portable cells for temporary lighting, and wireless telegraph work, Essex pasted plates, ignition coils, motor lamps, roof lights, hand lamps and other specialities. A second and smaller list deals chiefly with the "Essex" electric hand lamps, and electric fans.

MESSRS. P. E. CHAPPUIS & CO., 85, Fleet Street, E.C.—Card showing reflectors made of metal cones lined with patent silvered corrugated reflecting surface, for shop window lighting.

THE MAXA CO., 43-45, Cannon Street, London, E.C.—Small pamphlet entitled "Slack-Belt Driving: The Importance of Belts and Ropes," giving particulars of "Maxa" belt and rope dressing and preservative, its merits and directions for its use.

BRITISH THOMSON-HOUSTON CO., LTD., Mazda House, 77, Upper Thames Street, London, E.C.—We have received a pocket memorandum book from this company, who have removed their main lamp sales office to the above address. The leather cover is embellished with the company's lamp design. The book has a "refill" pad of blank sheets and a calendar for the remaining months of 1911, and for 1912. A list is given inside of the many types of lamps made by the company, also the addresses of the 12 sales offices.

THE RADIUM ELECTRIC LAMP CO., 82, Hatton Garden, London, E.C.—Price list of the "Radec" metal-filament lamps indicating that similar reductions to those announced by other firms have also taken place in the prices of these lamps.

MESSRS. GENT & CO., LTD., Faraday Works, Leicester.—Twelve-page booklet (No. 14) illustrating and describing their range of time signal apparatus, including correction indicator, time balls, deflecting needles, bells, and synchronising clocks.

The British Prometheus Co., Ltd., Salop Street Works, Highgate, Birmingham.—New 16-page booklet (No. 145) containing particulars and prices of their new electric cooking apparatus for hotel, restaurant, and domestic kitchens. All of the ranges, hot cupboards, ovens, and other apparatus are well illustrated.

Messrs. Siemens Bros. Dynamo Works, Ltd., 38 and 39, Upper Thames Street, London, E.C.—We have received a copy of the new edition (the second, October, 1911), of the firm's excellent "Electrical Supplies" catalogue. It consists of 300 pages of admirably arranged prices, illustrations, and sufficient explanatory matter, of a whole host of electrical materials which are exhaustively indexed alphabetically at the front, with thumb index to the various sections. Lamps (arc and incandescent), carbons, installation accessories, bells and accessories therefor, dry and wet cells, conduits and conduit fittings, wires and cables, O.S. wiring system, "Zed" fuses, distribution boards, knife switches, circuit breakers and time limit devices, lightning arresters, instruments and meters, electric cookers and heaters, fans and small motors—these mainly are the classes of goods covered. The wiring rules of the I.E.E. and a table of useful information concerning wires and cables are given toward the close. The catalogue is substantially bound and forms a very handy book.

Mr. D. Jaroslaw, 5, George Street, Tower Hill, London, E.C.—New price list of mica, micanite, and "Asbestonite" insulating material, also "Gnome" brand hard rubber (Stabilit). A current stock list of original cases of mica is included with the above lists in an expanding binding cover.

Western Electric Co., Ltd., Norfolk House, Victoria Embankment, W.C.—The "Western Electric Handbook of Cables and Supplies" is no ordinary catalogue. Part I, it is true, is devoted to a detailed and illustrated account of the company's wires and cables, aerial and underground, for electric lighting and power, telephony, mining and other uses to which electric cables are applied, with specifications of conductors and insulation, and all other necessary particulars; but Part II is a treatise on installation work, containing useful information on the laying and jointing of the various types of cables, with numerous illustrations, wiring tables and data, notes on illumination, the wiring rules of the I.E.E., and extracts from the regulations of the Board of Trade and the Home Office, the Phœnix Fire Office rules, the Report of the Departmental Committee on the Use of Electricity in Mines, and various reference tables, the whole forming a really handy and useful compilation of permanent value to the engineer engaged in cable laying and maintenance.

Messrs. Siemens Bros. & Co., Ltd., Caxton House, Westminster, S.W.—New edition of pamphlet No. B517 superseding the May, 1910, issue. This contains an up-to-date and more or less popular description of the O.S. wiring system and illustrates various applications of "Stannos" wiring. It also, on a number of pages, shows photographic illustrations of typical buildings in which the system has been installed. Contractors who desire a number of copies of this very presentable brochure, without the firm's name, for the use of their customers, should communicate to Caxton House, as above. A second brochure (12 pages) (No. RS7, in place of August, 1909 issue), gives a full and well-illustrated description of the Siemens battery signal machine. We understand that whilst the general features of the machine are retained, modifications have been made by substituting spur-gearing for worm-driving, with the effect that the efficiency is greatly increased, the time taken to lower a standard signal arm with the new machine being less than half what it was with the old pattern, with the same expenditure of current. The life of the battery is, therefore, lengthened.

Messrs. Simplex Conduits, Ltd., 116, Charing Cross Road, London, W.C.—A batch of Simplex literature has been received as follows:—Supplementary leaflet T.I. giving revised prices for Simplex conduits, light and heavy gauges, which came into force on November 1st; "Elektroduct" is a new type of conduit, consisting of a specially brazed tube with a smooth interior which can be made to more accurate dimensions than with a welded tube. A 30-page booklet describing the Holophane system of illumination, giving tabular spacing data for lighting desks, &c., and prices and illustrations of reflectors, globes, galleries, reflector bowl and sphere fittings, &c. A 20-page priced booklet of electric ovens, cookers, kettles and other heating and cooking apparatus. A 28-page booklet concerning electric radiators and convectors. In addition to the foregoing, there is a 144-page catalogue (new edition) of electric light fittings. This, of course, contains a most varied collection of fittings of all classes, and for all positions—brackets, pendants, electroliers, table lamps, candle-sticks, newel lights, and so forth. Reference numbers and prices are indicated in every case. Signs, shop window lights, and various glass and other shades (including the "Spookie") bring up to the rear. We have no doubt that the literature here mentioned will prove very serviceable to contractors and consumer seekers. In most cases copies of the pamphlets in quantities can be obtained printed with contractors' names and addresses.

Messrs. F. G. Edey & Co., Ltd., 25, Warwick Lane, London, W.C.—List giving reduced prices of "Eclipse" metal-filament lamps.

Messrs. L. E. Wilson & Co., 20, Cross Street, Manchester.—New 8-pp. catalogue illustrating and describing the Thomson electric pocket, inspection, police, military, cycle, reading and other lamps, and tabulating prices of same. Several improvements have been effected in the police lamp.

Bankruptcy Proceedings.—Joseph Augustus Bauer, 17, Gracechurch Street, E.C., trading as The Electrical and General Engineering Co.—An application for an order of discharge was made on October 24th to Mr. Registrar Giffard at the London Bankruptcy Court. Mr. W. P. Bowyer, Assistant Official Receiver, reported that the failure occurred in March, 1910, Mr. G. E. Corfield, I.A., being appointed trustee to administer the estate in bankruptcy. The liabilities were estimated by the bankrupt at £3,052; the assets valued by him at £455 had produced £245; and a dividend of 8¾d. in the £ had been declared. Since 1895 the bankrupt had carried on business in London as an electrical engineer under the above style. In 1899 he became a director of the "Electrical Corporation, Ltd.," in which he purchased £1,500 shares at par, in the hope that he would thereby obtain a lucrative position as engineer to the Corporation, in which hope, however, he was disappointed. In 1904 he sold to the Corporation for £500 cash and £3,000 in shares, a patent for an electric heater invented by him, but the Corporation went into liquidation in 1906. After the liquidation, he altered and improved the device for electric heaters, which he subsequently manufactured at 7 and 8, Great Winchester Street, E.C. Partly as the result of the failure of the Corporation, in connection with which he estimated his loss at between £1,900 and £2,000, the bankrupt was in financial difficulties in August, 1907, when he made a private arrangement with his creditors, under which a composition of 5s. in the £ was paid (with borrowed money) on liabilities amounting to about £1,400. Since 1901 he had also been director of the Metals Corporation, Ltd., and in July, 1908, became agent for, and director of, the Solium Electrical Co., Ltd., which had been formed to manufacture and sell a metallic-filament lamp, but it went into liquidation in October, 1909. For the purpose of the agency he took an office under the style of the Calux Electric Co., at 7 and 8, Great Winchester Street, E.C., and latterly also dealt there in electric lamps on his own account. He attributed his failure principally to losses in connection with the before-mentioned companies (£1,850), to law costs (£592), and to the loss of the agency. The books of accounts kept by the bankrupt appeared to disclose the bulk of his business transactions, though they did not record certain loans obtained from his father and his brother. The greater part of the losses in connection with the company appeared to have been incurred through transactions entered into by him previously to the arrangement with his creditors in August, 1907. With regard to the Solium Co., he had said that he was instrumental in its formation, and that he was appointed a director and sole agent of the company. He estimated his loss in connection therewith at £500, of which £250 represented travelling and other expenses, and £250 the price he agreed to pay for £1,000 vendors' shares in the company, of which sum £210 was returned in the statement of affairs as an unsecured liability. The remainder of the unsecured liabilities were business debts, including £1,560 due to cash creditors. As offences, the Official Receiver reported (1) insufficiency of assets to equal 10s. in the £ on the amount of the unsecured liabilities, and (2) a previous arrangement with creditors. His Honour unheld the report, and imposed the minimum term of suspension of two years. Order entered accordingly.

Jerome Walter May, importer of electric light fittings, &c., trading at 33, Cock Lane, Snow Hill, E.C., as J. W. May & Co.—Under a receiving order made in this case, the first meeting of creditors was held last week at the London Bankruptcy Court before Mr. W. G. Williams, Assistant Receiver. It transpired that the debtor started the business in partnership with another person in May, 1908; the partnership, however, was terminated in January, 1909, and the debtor had since traded alone, but under the same style. He attributed the failure to robbery by employés; heavy household expenses consequent on illness; loss of trade owing to his inability to properly attend to business; bad debts and want of capital. No statement of affairs was submitted, but the debtor estimated his liabilities at £1,100, and the assets, apart from certain book debts, were stated to have been realised for £450 by the trustee, under a deed of assignment executed by the debtor on July 15th last. Mr. G. E. Corfield, accountant, Balfour House, Finsbury Pavement, E.C., was appointed as trustee to administer the estate in bankruptcy, assisted by a Committee of inspection.

At the Leeds County Court on October 27th a receiving order was made on a creditor's petition against Oswald Carr, electrical engineer, of Oak Works, Headingley.

The Smaller Electrical Manufacturing Works in Germany.—In order to obtain a comprehensive evaluation of the extent of the minor or special trades devoted to electrotechnical production in Germany, the Verein Elektrotechnischer Specialfabriken, of Berlin, have made a series of inquiries over the past and present year, with results which, says the *Elektrotechnische Nachrichten*, have come as a surprise in technical circles. It appears that, exclusive of the several well-known large general manufacturing firms, there are 340 special electrotechnical manufacturing works, employing 73,000 workmen; these are exclusive of smaller firms, estimated at some 300, employing a few workmen each, but bringing the total of workmen employed up to 80,000. These figures represent at least one-half of the aggregate of those employed in the electrotechnical manufacturing industry. It is remarked that these figures are possibly somewhat exaggerated, as they are adduced as an argument against allowing the large general manufacturing firms to monopolise the exploitation of "überland centrale" and other big public undertakings.

Trade Announcements.—Mr. G. Braulik has opened a branch office at Prince's Chambers, 16, John Dalton Street, Manchester, and has appointed Mr. Wyndham Wadsworth to represent him for Manchester and district. Mr. Braulik desires it to be known that he is now making and supplying under the Bremer-Westinghouse patent, his old type direct-current flame arc lamp, and immediate requirements can be supplied from stock, under the licence of the Bremer-Westinghouse patents.

Mr. Wm. Morgan, electrician of Leytonstone, N.E., has

removed his business from Ester Road to large premises at 831, High Road

The business of Cowans, Ltd., will in future be carried on in conjunction with that of the Switchgear Co., Ltd., for which purpose a new company, under the name of Switchgear & Cowans (1911), Ltd., has been registered and financed. The business will be carried on at the Springfield Lane Works, which are well equipped with modern high-class machinery, capable of dealing with large orders expeditiously, now that ample working capital is available to keep proper supplies of standard stock to meet customers' requirements. Extra-high-tension equipments will be one of the specialities of the company. The new combination will be under the personal control of Mr. J. G. Statter, as managing director, who heretofore controlled the business of the Switchgear Co., Ltd.

Messrs. Drake & Gorham, Ltd., announce that, owing to increased turnover, they have taken an additional warehouse and offices at No. 1, Felix Street, Westminster Bridge Road, S.E., and in future their wholesale supply business will be conducted from that address.

Dissolutions and Liquidations.—Power Accessories, Ltd.—This company is winding up voluntarily, with Mr. S. P. Hutton, Rolt Street, Deptford, as liquidator. A meeting of creditors was called for November 2nd.

Economic Electric Co., Ltd.—This company is winding up voluntarily, with Mr. F. T. P. Deyes, 5, Cook Street, Liverpool, as liquidator. A meeting of creditors is called for November 7th, at Liverpool.

LIGHTING and POWER NOTES.

Abingdon.—In response to a memorial, a public meeting has been held to consider the advisability of establishing an electric installation in the town. A resolution, moved by Mr. T. Skurray, inviting the local Council to consider the question of carrying out a scheme of its own, rather than allow a private monopoly to take the matter up, was carried unanimously.

Acton.—The Metropolitan Electric Supply Co. has, with the acquirement of the Council's electricity undertaking, taken over the whole of the electricity Committee's staff, and Mr. J. Martin Blair, resident electrical engineer, has just completed the organisation of business premises in the centre of the town, which include a very fine and up-to-date showroom, displaying almost every kind of electrical apparatus. In view of the great number of factories, laundries, &c., in the Acton district, special attention is to be devoted to the facilities for extending current for power purposes.

Australia.—A difficulty has arisen between the Sydney City Council and the Leichhardt Council in regard to the former supplying current throughout the latter municipality. The City Council desired exclusive rights for the supply. The Leichhardt Council decided that the draft agreement submitted by the Balmain Electric Light and Power Co. would be acceptable if the amendments recommended by the Sub-Committee of the local Council were agreed to by the company.

The Launceston (T.) municipal electric light and power works made a net profit of £3,897 during the year which ended in July. This is the largest profit recorded since the current was first supplied 16 years ago, and £400 better than the previous year.—*Australian Mining Standard.*

Melbourne.—The E.L. Committee of the Melbourne Council has proposed, and the City Council agreed, to sweeping reductions in the price of energy for light, heat and power. The new charges are, briefly:—Lighting, 3½d. per unit, first 3,000 units per month, 3d. afterwards; or, on M.D. system, 6d. and 1½d. per unit; power and heat, 1½d. per unit, or, M.D. system, 2d. and ¾d.; private arc lamps, based on 3½d. per unit; public street arcs, reduced to £16 10s., and incandescents £4 per annum. The Committee has carefully considered the probable result of these reductions, and estimates a total reduction of revenue per annum, based on the 1910 figures, amounting to £22,691. Reference to the statement of accounts for the year 1910-11 will show that the reductions now recommended would exhaust the balance to credit of net revenue account for that year, after payment of all fixed standing charges, but the development of the undertaking during the current year, together with the further increased demand which would certainly result from these reductions, and the consequent reduction in the cost of production per unit, warrants the Committee in anticipating that the accounts for the year 1912 will show a substantial balance to credit of net revenue account, after payment of all fixed standing charges, to provide for the additional contribution to depreciation and renewals fund, and the contribution to the town fund which it has been the desire and the principle of the Council to make; and which, in the Committee's opinion, should certainly be made by any successful municipal undertaking.

The Committee had hoped to be able to submit a recommendation for an allowance to users of metal lamps equivalent to the cost to the Council of renewals of carbon lamps (which are included in the cost of current), but has been unable to do so.—*Engineering and Electrical Record.*

Axbridge.—The work of providing electricity for the town has been commenced by the Winscombe Electric Light and Power Co., and it is hoped to have the supply available by Christmas.

Baildon.—The U.D.C. has been informed that the Wharfedale Electric Supply Co. has abandoned the proposal to seek powers to supply electricity in the Council's area.

Barking.—The engineer has been instructed to proceed with the work of converting the existing 460-volt carbon lamps in certain streets to 230-volt metallic-filament lamps. He is also to submit a further report on the running of trailer cars, as he is of opinion that by doing this the Council would be able to cope with heavy traffic at certain times, besides reducing the heavy wear and tear of the present cars.

Barrow.—At the T.C. meeting on October 30th the Electricity Committee reported the receipt of a letter from the B. of T. forwarding consent to the placing of an overhead line at Biggar Bank, Walney Island.

Bettwys-y-Coed.—At the beginning of the present lighting season the Urban District Council refused to accept the North Wales Gas Co.'s tender for the approaching winter lighting owing to the company's demand for a higher rate per lamp, with the result that the village has since remained unlit. The Council has resolved to go in for a new water supply scheme and electric light plant. Elsie Lake, situated at a higher elevation above the village, is to be utilised for both purposes, the schemes being under the charge of Mr. E. Evans, the county surveyor for Carnarvon, and Mr. W. Willoughby Lane, electrical engineer, Llandudno. A L.G.B. inquiry was held on November 1st in connection with the scheme.

Biddulph.—After considering the report of Messrs. Crews & Handford, Manchester, who were engaged to advise on Messrs. Heath's scheme for supplying Biddulph with electricity for lighting purposes, the U.D.C. has decided to take the necessary steps for obtaining a prov. order.

Bootle.—In consequence of the increasing demand for current for lighting and industrial power purposes, it has been found necessary to extend the plant at the Corporation electricity works. At the meeting of the Town Council on October 25th, the Electric Power and Lighting Committee's recommendation on the report of the borough electrical engineer, on the proposed extension of the plant and works, foreshadowed in his annual report, was approved.

Bradford.—On Friday, last week, Mr. T. C. Ekin, of the L.G.B., inquired into an application by the Corporation for sanction to borrow £16,940 for extensions of plant at the Valley Road electricity works. The application was to provide extra machinery in consequence of the increased demand for lighting and power. On the day preceding the inquiry the load was 7,763 kw., as against 6,860 kw. on the corresponding day of last year. The inquiry was closed.

Bridlington.—The T.C. has decided to apply to the L.G.B. for loans of £2,000 for mains, and £1,000 for services.

Brighton.—An electrical exhibition at the Aquarium, organised by the Corporation Electricity Department, was opened by the Mayor on Saturday last. Thanks to the efforts of the borough electrical engineer, Mr. John Christie, a fully representative collection of electrical exhibits has been gathered together, special attention having been given to cooking and heating apparatus. As regards the latter, continuous demonstrations of baking are being carried out by Messrs. Green & Co., and Messrs. Muttons, a leading firm of restauranteurs, have their chef in constant attendance doing practically the whole of their cooking for their restaurant in King's Road, in the way of roasting, baking, &c., for serving cold. Mr. Christie is personally demonstrating the use of apparatus, and we can only add that such practical methods of pushing electrical cooking, synchronising as they do with the introduction of an unrestricted flat rate of a 1d. per unit for such purposes, deserve every success. The exhibition has been well advertised locally, and we understand that there was a record attendance on the opening day.

Bury.—At a meeting of the T.C. held on October 26th, it was announced that the new electricity works would be officially opened about November 27th.

Carluke.—The Clyde Valley Electric Power Co. has under consideration the advisability of extending its electric cables to Carluke. The nearest connection with its existing system is at Wishaw, a distance of five miles.

Continental Notes.—Italy.—La Società Ligure-Toscana d'Elettricità, which has a 6,000-h.p. steam-operated generating station at Leghorn, will shortly put in operation a new 6,600-h.p. plant, utilising the water-power of the Lima, a tributary of the River Serchio. The transmission lines extend close upon 70 miles, and will supply current for lighting and power purposes to the towns of Lucques, Viareggio, Montecatini, Pisa and Leghorn. With the completion of the new plant it is hoped to almost completely to do away with the cost of coal, hitherto about £8,800 per annum. At the same time the old station will be kept intact as a reserve to supply current pending the installation of other generating stations, the concessions to utilise water-power secured by the company extending to a total of about 25,000 h.p.

Dewsbury.—At a recent meeting of the Council a report of the year's working of the electricity works was presented. The total receipts were £11,821, against £11,065 in the previous year. The cost of generation had been 60d. per unit, as against 67d. and 76d. in the previous two years. Distribution and management costs were 39d., making the total cost 99d. per unit. The sale of current had been 1,298,058 units, against 1,209,657; the number of lighting consumers was 494, against 454; and of motors 164, against 138. The increase in lighting supply had been 9 per cent., and in power 36 per cent., while tramway supply, in consequence of economical working, had decreased by 3·8 per cent.

Donaghadee.—The Urban Council has decided to proceed with the electricity scheme for lighting the town. At the last meeting of the Council the town clerk was instructed to apply to the B. of T. for the necessary permission to erect overhead wires. The scheme includes the pumping at the proposed waterworks which is to be carried out by electrical power.

Douglas (Isle of Man).—Mr. Handcock, of Messrs. Handcock & Dykes, of London, who has been appointed to report on the question of an electricity supply for the town, outlines a scheme, the estimated capital cost of which is £24,789. The price of current should be such as to give an average annual revenue of 4s. 9d. to 5s. per 25-C.P. lamp installed, which is a reasonable price. The Council is advised to proceed at once with the electric light undertaking.

Dukinfield and Mossley.—The B. of T. has authorised the placing of certain overhead lines in Dukinfield and Mossley by the Tramways and Electricity Board for the transmission of energy.

Edinburgh.—By an outbreak of fire in one of the two water-cooling towers at present in course of construction at the Corporation electric lighting station in Dewar Place, considerable damage was done last week. The tower was nearing completion, and keen disappointment is expressed by the Corporation engineer at the delay, and the mishap that has caused it. While the fire raged the tower became a mammoth chimney, and the fire brigade had great difficulty in dealing with the outbreak.

Govan.—It is proposed to introduce electric light at Hawkhead Asylum, and on this account it was suggested that a deputation from the District Lunacy Board should visit certain asylums in England and inspect their lighting systems. At a meeting of the Board last week the proposal was criticised, one member claiming that high-pressure incandescent lighting was superior to electricity, and another that there were many points to consider before they rushed into an expenditure of £6,000 or £7,000. The Board agreed to send a deputation.

Great Harwood.—A special meeting of the Council was held on Monday to consider the advisability of applying to the B. of T. for a provisional order to enable the Council to supply electricity to the town under the Electric Lighting Acts.

Holmfirth.—The U.D.C. has decided that application be made immediately to the L.G.B. for sanction to borrow £8,000 for electric lighting purposes, and that the consent of the B. of T. be sought for the construction of overhead electric transmissions in the urban district.

Ilford.—The Electricity Committee has decided to grant the following concessions to consumers of current: (1) 5 per cent. discount on all bills promptly paid; (2) reduce the cost of current for heating and cooking to 1½d. per unit for the first 100, and 1d. per unit for the second 100. With regard to the price of current for lighting, the Committee states that it could not make any reduction, as this corresponded favourably with the average price charged by the London Borough Councils and companies.

India.—The Rangoon Electric Tramway and Supply Co., Ltd., which was formed in 1905 to electrify existing steam tramways and provide a supply of electricity for general use, has a power station on the banks of the Rangoon river. This contains an equipment of vertical Curtis turbines, two of 700 KW., one of 1,500 KW., and one of 2,500 KW. capacity, constructed by the B.T.-H. Co., and supplying three-phase current at 2,300 volts; also a 500-KW. Belliss traction set and a 500-KW. motor-generator to link up the A.C. & D.C. systems, together with steam-driven exciters. The condensing plant is of the barometric type supplied by Mirrlees, Watson & Co., while steam is supplied by Babcock boilers, each battery of boilers being provided with its own steel chimney. The three-phase transmission is by means of underground cables to various transformer sub-stations, from which a L.T. four-wire three-phase distribution system radiates. The pressure across the outers is 200, and across one outer and neutral 115 volts; the original distribution system, a single-phase one, has been displaced by the above owing to the demand for motors. Each sub-station is fed by its own feeder, but the various sub-stations are also interconnected. The L.T. lines are carried overhead; in view of the Government regulations it was not found possible to run the H.T. cables in this way, although it was originally intended to do this. In addition to the three-phase distribution, a proportion of the lighting has been carried out on the constant current system. The main thoroughfares are lighted by arc lamps run in series from constant current transformers, damaged lamps being automatically cut out of circuit, while the transformer adjust the necessary altered pressure. Smaller streets are also equipped in the same way, but with incandescent lamps.

Jarrow.—At the annual meeting of Palmer's Shipbuilding and Iron Co., Ltd., at Newcastle-on-Tyne, on the 27th ult., Lord Furness, the chairman of directors, in moving the report, referred to developments they wished to make at the Jarrow works. At the steel works they wanted to put in a gas producer plant, involving a capital outlay of £15,500. There were also alterations and extensions required to the cogging mill to cost about £41,700, which improvements would effect a net annual saving of about £19,000. Similarly, and this was the most important project they were anxious to tackle, by an outlay of £158,230 on a power scheme to utilise their blast furnace gases, and, allowing 10 per cent. interest and redemption, they looked to make a net saving of £23,000 per annum.

Leigh-on-Sea.—The U.D.C. has decided to ascertain whether electricity in bulk can be supplied to the Council by Southend-on-Sea T.C.

Liverpool.—As a sequel to the labour troubles in Liverpool, an illuminated certificate of thanks, bearing the city arms, has been issued on behalf of the city, by the Lord Mayor, to the voluntary workers at the power station when the employés went on strike. It reads: "City of Liverpool. I hereby certify that (name) rendered assistance as a voluntary worker at Lister Drive electric power station during the strike in August, 1911. On behalf of the Tramways and Electric Power and Lighting Co., I tender to him the thanks of the Committee for the valuable services rendered by him to the Committee and the community at large." The certificate is signed by Mr. Mason Hutchinson, Lord Mayor.

London.—POPLAR.—A report has been received from the engineer with reference to the proposed improvement of the public lighting of the borough. In this report he states that experimental lighting has been in progress for some time past by the installation of flame arc lamps in the East India Dock Road and Bow Road, and large candle-power incandescent lamps in North Street, Bridge Road, East India Dock Road and Campbell Road. The result had been successful from an illuminating point of view, and he suggested that the future policy in regard to public lighting should be considered on the following lines:—(1) Flame arc lamps to replace the whole of the existing open-type arc lamps in East India Dock Road and Bow Road; (2) 600-C.P. incandescent lamps to replace 10-ampere open-type arc lamps other than those in East India Dock Road and Bow Road; (3) 300-C.P. incandescent lamps to replace all 7½-ampere open-type arc lamps; (4) all gas lamps to be replaced by electric incandescent lamps as soon as practicable after the mains are extended to those thoroughfares where only gas is now available; (5) as the efficiency of metal lamps will undoubtedly improve, the candle-power to be increased in proportion to increase in the efficiency of the lamps; (6) the standing charge for public lighting supply to be reduced from £13 to £11 per KW. from April 1st, 1912; (7) that the whole of the improvements contemplated be paid for out of future economies realised in lamp maintenance and the supply of energy. The total amount of loans raised on account of electric public lighting was £15,441, of which £6,524 had been repaid at March 31st, last. A sum of £8,916 still remained to be repaid, and no further indebtedness was proposed to be incurred on this account. Owing to a reduction in charge for energy, a saving of £710 was effected last year, compared with the last four years. The proposed reduction in price for next year would amount to £383, and still further reductions were contemplated in the following year, and he was of opinion that these reductions and further economies to be effected by conversion from gas to electricity, &c., would provide a sum sufficient to pay for the whole of the improvements outlined, without resorting to further borrowing, or entailing any further charge upon the rates. After considering this report, the Electricity Committee states that it is of opinion that the proposals of the engineer would effect considerable improvements in public lighting without increasing the present cost, and it recommended that the total cost of public lighting in respect of existing lamp columns be limited to a maximum of £10,850 per annum during the three years ended March 31st, 1915, and, that, during that period the improvements indicated in the foregoing report should be carried out, including the reduction of the charge for public lighting from £13 to £11 per KW. from April 1st, 1912. This was agreed to at the Council meeting held on the 26th ult.

FULHAM.—The Electricity and Lighting Committee reports that in March, 1908, the Council adopted a scheme for the provision and maintenance of arc lamps on the rental system at the rate of £8 16s. per lamp per annum, on the basis that the lamps would be used for a period of 800 hours during each year. This the Committee states had been found to operate against the scheme in those cases where the shop hours are such that the light is not required for such a length of time, and it proposed to consider whether the scheme could not be revised to obviate the difficulty. In the meantime the Committee had had an opportunity for installing seven arc lamps, provided a fixed charge of £8 per lamp per annum was made for an estimated use of the lamps for 700 hours per annum, and it was of opinion that this modification of the scheme should be agreed to in this instance. A recommendation was submitted accordingly.

SOUTHWARK.—The Electric Lighting Committee has decided to replace the obsolete mechanical stokers with the newest type of chain-grate stoker at the estimated cost of £1,180, and prices are to be obtained from the leading makers for supplying same.

On Monday last a new Belliss-G.E.C. mixed pressure turbo-generator was officially started up by the Mayoress, at the Council's generating station. The set is of about 600-KW. capacity, and coupled to a D.C.-three-phase machine—the A.C. feature having been

embodied in view of a possible linking-up scheme. It is confidently anticipated that this machine, in conjunction with the new condensing and cooling tower installation, will materially improve the generating costs.

St. Pancras.—The Electricity and Public Lighting Committee reports having communicated with the L.C.C. with regard to allowing the Borough Council to place free advertisement tablets of the electricity undertaking on the County Council's tramcars in exchange for permission to fix tramway direction signs on the B.C.'s lamp columns. A letter had been received in reply, refusing consent. The Committee has therefore decided that the application of the L.C.C. to fix tramway direction signs on the Council's lamp columns should not be entertained.

Stepney.—The Council has decided to take up a loan of £15,700 from the L.C.C. for the laying of mains. Mains are to be extended to Parnham Street, Limehouse; Skidmore Street, Mile End Old town; and Pennington Street, St. George-in-the-East.

Mansfield Woodhouse.—The Mansfield T.C. has decided tb obtain particulars of the cost of giving a supply of current to the town, and to ascertain the probable number of consumers.

Mexico.—The *Mexican Herald*, of September 20th, states that more than 1,000 men are at work on the River Conchos dam, and reservoir, which it is announced will be completed by June, 1913. The power generated will be transmitted to the Parral Naica, Santa Barbara, Santa Eulalia, and other mining districts of Chihuahua. Water will be stored along the course of the Conchos for a distance of 30 miles, the reservoir varying in width from 4 to 5 miles. The total cost of the work is estimated at about £1,530,000. The undertaking is being carried out by the Mexican Northern Power Co., a Canadian company.—*Board of Trade Journal.*

Reddish.—Steps are being taken to induce the Stockport T.C. to extend the E.L. mains to Reddish.

Salford.—At the T.C. on October 26th a report was presented by the Electricity Committee with reference to the proposed borrowing of £15,550 to cover the cost of the provision of two new turbo-generator sets with the requisite fittings at the Frederick Road generating station, and a scheme for the alteration and extension of the existing plant at a cost of £20,000, the latter sum to be provided out of the reserve fund of the undertaking. It was stated that in 1902 the consumption of energy for lighting purposes was 795,000 units, and for traction 458,000. At the present time there were generated 2,160,000 units for lighting purpose and 7,000,000 for motive power. It is estimated that the alteration to the engines will effect a saving of £4,040 per annum in coal alone. A resolution was passed adopting the scheme and authorising the expenditure of £35,500, and directing application to be made to the L.G.B. for sanction to borrow £15,500.

South Africa.—The *South African Mining Journal*, commenting on the rumours which have been about regarding the Rand Mines Power Station at Rosherville, points out that, generally speaking, operations are being carried on smoothly and efficiently. If trouble exists it is due to the estimates of requirements falling short of the actual demand, which is far in excess of what was considered probable. The Rosherville plant is now supplying some 16,000 H.P., and it is asserted that the contracts entered into are being fulfilled, but to supply the whole demand would require an output of 36,000 H.P. A certain amount of competition has occurred between purchasers, and some mines have reverted to steam in favour of others which have no facilities for steam generation. About 20,000 H.P. of compressed air plant is operated by the turbine plant at Rosherville, and electrically at the Robinson Deep. The construction of the Vereeniging plant now commenced, will help to meet the widespread demand for electrical power.

Queen's Town (Cape Province).—After a long delay the electric lighting scheme has at last received the sanction of the Provincial Council, and the final details of the scheme which were sent by Mr. Bellad-Ellis to the Government for the approval of the Government electrical engineer, Mr. Denham, have been passed by that official; we understand that the work will now proceed forthwith.

Stoke-on-Trent.—During the past year the four electricity undertakings of the Corporation have sold 5,056,998 units. Of this, private consumers' lighting took 1,527,764 units; motors and heating accounted for 3,076,084; and street lighting represented 453,150. Compared with the previous 15 months, the sales of energy, &c., from the Burslem Works last year show an increase of 178,208, the total being 1,471,805. The surplus or "profit" on the working for the year 1910-11 was greater than that for the 15 months 1909-10 by £49, while the costs per unit were less. The net receipts per unit fell below 1½d. After repayment of sinking fund, and of meters and services, Burslem made a profit of £676, which the Committee recommends the Council to allocate to the reduction of the suspense account (over £3,000). The net receipts totalled £8,746, against £8,137 in the preceding 15 months.

For the first time the output at Hanley exceeded 2,000,000 units, the exact figure being 2,042,356. Breakdowns cost about £750, but a net profit of £406 has been transferred to the reserve fund. The net receipts were £18,008, compared with £16,697 last year. The supply increased at the Longton Works by nearly 90,000 units, bringing the output sold up from 306,186 to 395,796 units. The total net receipts were £4,224, against £3,530 last year. The profit of £382 has been transferred to form a reserve fund. The increase of output at the Stoke Works was nearly a quarter of a million units, and for the first time the output exceeded 1,000,000 units. The figures were 1,147,041, against 899,356 last year, an increase of 247,685. The net total receipts were £7,050, against £5,522 last year. A loss in the undertaking in 1909-10 of about £350 has been changed to a profit of £276, which will be devoted towards wiping out the previous year's loss.

The T.C. has received from the L.G.B. sanction to the following loans:—£13,094 for H.T. cables; £30,641 for additional plant; and £7,285 for buildings. The balance of a sum of £60,000 is to be applied for, for contingencies.

Swansea.—The T.C. has decided to light a portion of Sketty Road with 300-C.P. metal-filament lamps, in place of gas.

West Bromwich.—The sales from the Corporation's electricity undertaking for the quarter ending September 30th amounted to £3,888, compared with £3,261 for the corresponding period of last year, an increase of £627, which equals 19·23 per cent.

Wolverhampton.—On behalf of the L.G.B., Mr. H. R. Hooper on Tuesday held an inquiry into an application by the Corporation for sanction to borrow £11,000 for extensions to the buildings and plant at the electricity station. The town clerk explained that from the reserve fund £10,000 would be taken to provide the storage battery, and the present application was in respect only of the building in which to house it. The inquiry was unopposed.

TRAMWAY and RAILWAY NOTES.

Ashton.—The B. of T. has appointed Mr. Ernest Moon, K.C., to act as arbitrator in the dispute between the tramway employés and the authorities in the Ashton district. The object of the men is to obtain uniformity of pay and working conditions on the three tramway systems in the area. Their demands include a 9½ hours day, and that all overtime be paid for at the rate of time and a quarter, six days' holiday per year with pay, instead of three days as at present, adequate meal times, and maximum wages of 32s. 6d. per week for motormen and 27s. 6d. for conductors. The arbitrator has provisionally fixed November 7th as the date of the inquiry.

Australia.—The leading recommendations of the report of the Royal Commission appointed by the Victorian Parliament last year, to consider the tramway and railway problem of Melbourne and its suburbs, are stated as follows:—

"That the purchase of the existing tramways operated by the Melbourne Tramway Co. be undertaken as early as practicable.

"That the whole of the metropolitan tramway systems (privately and publicly owned) be vested in and operated by a municipal tramways trust.

"That the cable tramways be converted electrically, route by route, as extensions from the present cable termini and overcrowding of the routes necessitate.

"That the overhead span wire system be adopted, and through and sectional fares be provided.

"That the suburban railways be electrified, and the best expert advice be obtained as to the most suitable system to be adopted in view of recent developments.

"That a large and up-to-date State power supply be established, capable of providing all the electricity required for railways, tramways, and other public and private purposes at low rates."

With respect to the recommendation last mentioned, the Commissioners estimate the total electrical power required for Melbourne and suburbs at 90,000 H.P. They therefore urge that a central power house be established, capable of supplying all the electrical energy required by the railways, tramways, factories, and electric lighting of the metropolis, and that the central power house, high-tension transmission lines, and converter stations be under the control of the Railways Commissioners, and that these three items of electrical equipment should be located so that they can best supply the whole of the services in the metropolitan area. The cost of converting the existing cable and horse tramways to electric lines, and constructing 80 miles of additional track, is set down at £2,550,718. If power were supplied from the State (railway) power house, this cost would be reduced by £170,000. Electrification of the suburban railways is only recommended on condition that the work should be undertaken only after an exhaustive inquiry by some eminent authority, to determine, among other things, whether the direct-current or the single-phase alternating-current system should be adopted.—*Engineering and Electrical Record.*

Birmingham.—About 2,000 men employed by the Corporation to work the municipal tramways are discontented with their conditions of service, and a memorial has been forwarded to the Tramways Committee asking for the following terms: (1) Time and half for all Sunday duty and bank holidays; (2) time and half for all time over nine hours per day; (3) double time for Christmas Day and Good Friday; (4) each day to constitute a day's work; (5) guaranteed 48 hours per week for spare men; (6) conductors when finishing duty on the road to be allowed time to go to the depôt to pay in; (7) every employé to reach the maximum rate of wages on entering the third year of service; (8) no employé to be suspended until he has been to the head officer, unless it be a very serious offence; (9) lighter uniform for summer; (10) discontinue publishing the names of men in the depôt for energy consumption, which causes discontent amongst the men; (11) no

inspector to report any employé for an offence unless the man is notified at the time of the offence; (12) formation of a Conciliation Board. Although the Corporation men only are affected, it is understood they have the sympathy of the employés serving the various companies running cars in the Midlands. No reply has yet been received from the Committee.

Bradford.—At a meeting of the City Council last week, it was decided that application should be made to the B. of T. for a prov. order authorising the use of railless tramcars on several streets and thoroughfares in the city.

Continental Notes.—Russia.—The Russian Ministry of Ways and Communications is reported to have decided on the electrification of all the railways in the St. Petersburg district. The water-power of the River Wolkhoff, in the Government of Novgorod, will, it is said, be utilised in the generation of the necessary electrical energy.

Norway.—According to a recent report to his Government by the United States Consul-General at Christiania, the "Kristiania Elektriske Sporvei, Valkyriegade No. 21," Christiania, propose to make a tunnel to enable the street tramways of the town to reach eventually a neighbouring amusement resort on a hill three miles away. —*Board of Trade Journal.*

Austria.—The *Financial News* correspondent says that, at the meeting of a special committee of the Traffic Commission of Vienna, held last week, concerning the construction of a Vienna underground railway, the French proposal forwarded by a French group, headed by the Société Centrale des Banques de Provinces and the Omnium Lyonnais des Chemins de Fer et Tramways, was well discussed, together with the proposal of the German-Austrian group. It was decided to recommend the Traffic Commission to start negotiations with the French group, which estimates the cost of the enterprise at about 100,000,000 fr.

Germany.—The *Vossische Zeitung* learns that the technical details for the electrification of the Berlin municipal tramways have been completed in the Ministry of Public Works, and that the Minister hopes to be able to carry out the works next year. The money vote is expected to be carried by the Finance Minister next spring.

Douglas (Isle of Man).—In a report to the T.C. relative to the advisability of electrifying the tramways, Mr. Handcock advices that no immediate steps should be taken in the matter, and suggests that a further report should be presented on the completion of the proposed E.L. undertaking. The overhead system is advised, together with the relaying of the track with 100-lb. rails. The cost is estimated at from £80,000 to £85,000.

Ealing.—The Ealing Chamber of Commerce, members of which recently visited Leeds and Bradford, is urging the T.C. to establish a system of railless traction as a means of securing better communication between Ealing Broadway and the outlying districts.

Edinburgh.—After a two hours' discussion, the Corporation Tramway Committee has decided to postpone making an application to Parliament for power to use railless trolley vehicles. It was explained that the new motor-'bus of the petrol-electric type which has been introduced into London, has been found to overcome many of the disadvantages of the motor-'bus as it has hitherto been known. In the light of this knowledge, further consideration was claimed to be necessary.

Glasgow.—A lengthy, and sometimes acrimonious, discussion again took place at the T.C. meeting on points of tramway administration on a proposal by Mr. Lyon, who asked that the Tramways Committee should be empowered to draft a new agreement by which the responsibilities of the general manager would be lessened, and those of the Committee increased. Mr. Lyon pointed out that he knew of cases of men in the service of the department being unfairly and unjustly dismissed. Mr. Dalrymple, the manager, might not know of those cases, and he suggested that all such instances should be heard by the Committee. He asked that employés should have the right of appeal to a neutral body. In moving the previous question, Bailie Russell, convener, argued that the present agreement had worked very satisfactory all along. Mr. W. G. Anderson asked what would happen if the 7,000 employés in the department came to the Committee with individual grievances. The position would be worse than that of the Railway Commission—they would have to sit permanently. The amendment was adopted by 34 votes to 21.

The T.C., at an early meeting, will be asked to consider an important recommendation by the Tramways Committee. This is a suggestion for the re-opening of the tunnel, vehicular and pedestrian, under the Glasgow Harbour—through arrangement with the proprietors—but that through tickets be issued by tramway cars from the top of Finnieston Street and *vice versâ*, allowing passengers to travel by car in Finnieston Street and by the tunnel to Plantation, descending and ascending by the elevators and walking through the tunnel.

Halifax.—At a special meeting of the T.C. last week, a resolution of the Tramways Committee, asking for authority to carry out doubling of the track, at a cost of £10,715, was adopted. A motion was moved that tenders be invited by advertisement for carrying out the necessary works. It was eventually decided that the words referring to advertising for tenders be deleted.

Hove.—A special meeting of the T.C. was held on Friday last week, and discussed for two hours the question of obtaining powers to run railless trolley vehicles; in the end an amendment referring the whole question to the Legal and Parliamentary Committee for report, was carried. Mr. Fraser, who opposed the proposal, explained that it was not imperative for them to proceed to promote a Bill, and if they did they would be doing immense good to Brighton in their project; apparently this view of the matter decided the Council in its peculiar attitude. The Brighton Council has decided to promote a Bill to work railless vehicles on the east and west routes, at present served by motor-omnibuses.

Hull.—The assessment of the Corporation tramways in the parishes of Holy Trinity and St. Mary has been increased from £13,541 gross to £22,945, and from £8,052 net to £11,973. The Council will appeal against the increases, which total £13,325.

London.—Stepney.—The B.C. has circularised the other Councils with regard to the decision of the L.C.C. to seek Parliamentary authority permitting the overhead trolley system of electrification for working the existing horse tramways which run from the West India Docks to Cassland Road, Hackney, notwithstanding that the authorisations of the B.C. in whose boroughs the tramways are laid have not been obtained as provided by Sec. 23 of the L.C.C. Tramways (Electrical Power) Act, 1900. The B.C. stated that the overhead trolley system had been successfully adopted in certain localities of the metropolis, but that this was the first occasion on which the L.C.C. attempted to obtain authority to ride rough-shod over the heads of the local authorities, empowered by Parliament to give consent to its adoption. The Council further stated that should success attend the efforts of the L.C.C., it seemed obvious that a precedent for ignoring in future the wishes of the metropolitan Borough Councils, whose views on the overhead trolley system ran counter to their own, would be established, and they hoped that the various Councils would do all in their power with a view to continuing the salutary veto conferred upon them by Sec. 23, and that they would communicate with the members of Parliament and the L.C.C. representing them, to rigorously oppose the attempt made to override the wishes of those responsible for local administration.

L.C.C.—On Tuesday last the Council, by 61 votes to 51, decided to postpone consideration of the proposed St. Paul's Bridge tramway scheme, pending the production of a report on the merits and total cost of the scheme. It appears that the scheme, owing to the Home Office insisting on a wide approach on the south side of the river, would cost not less than three-quarters of a million pounds, as against £350,000 originally suggested.

The Council passed without discussion the Highways Committee's recommendation that Parliamentary powers be obtained for the running of coupled and trailer cars on the Council's tramways. The negotiations with the B. of T. and the Commissioner of Police regarding this matter are summarised in a leaderette in this issue.

Oxford.—The decision of the City Council, rejecting the trolley system of tramways, mentioned last week, was come to after considering a letter from the National Electric Construction Co., who are under a contract to complete the tramways before 1912. The company pointed out that Bournemouth had rejected the combined system of trolley and conduit, as proposed for Oxford, and emphasised the difficulty of raising capital for such a scheme. The voting was 46 to 6 against the Tramways Committee's proposal to negotiate for a trolley system.

Paisley.—It is announced that the negotiations between T.C. and the Paisley District Tramways Co. regarding the arrangement of a flat rate of charge for electric current in substitution of the present arrangement under the arbiter's award have come to a successful conclusion. Representatives from the Tramway Co. have had several meetings with a Sub-Committee of the Council in the endeavour to adjust matters, but up to the present without much success. At the last meeting Mr. D. Johnstone Smith, on behalf of the company, suggested as an appropriate rate ·893d., or in round figures, ·9d., the Corporation, however, wishing this raised to ·952d., no definite conclusion was arrived at. It is now stated, however, that both parties have agreed to a flat rate of ·975 of a penny per unit, and that the arrangement will be retrospective, dating back to August 17th of last year, when the arbiter's finding came into force.

Sheffield.—As from October 30th passengers intending to ride on the top compartment of the Corporation cars are requested to pay their fares as they get on the cars.

South Africa.—A special meeting of the Boksburg T.C. was held recently to consider the report of the Tramway Committee with regard to the construction and installation of a railless electric traction system of trams for Boksburg. The recommendation of the Committee, that a railless system of electric trams be installed, at a cost not exceeding £17,000, was adopted.

Maritzburg.—The tramway system was recently interrupted for many hours, owing to the very heavy thunderstorm, the insulators being destroyed by the heavy discharges, causing the staff to work all night to effect repairs. The lights of the G.P.O. went out and candles had to be used, while telephone shocks were numerous, but no casualities were reported.

South Shields.—At a meeting of the T.C. on October 25th the Tramways Committee submitted a long report, in the course of which it recommended that the tramway employés be granted an increase of wages of ½d. an hour, and that the bonus scheme, introduced as an incentive to motormen to use their best endeavours to economise in the use of current, should be abolished. The tramways manager, in a report, stated that the bill for electric current last year showed the enormous reduction of 16 per cent. as compared with

the previous year, amounting to £900, and this he attributed to the bonus scheme. Mr. Henderson moved the adoption of the report, contending that the reduction in the consumption of energy was due to the increased skill of the motormen, and no energy would be wasted if the bonus scheme were abolished. Mr. Batey, in seconding the report, said there was no objection to continuing the use of the meters on the cars, so that the manager could tell whether any particular man was wasting energy or not. The deputation of the motormen who put their case before the Committee proved, as a result of this bonus system, a tendency on the part of the motormen to stop their cars as seldom as possible, and to rush hills. Alderman Wylie, chairman of the Tramways Committee, who opposed the proposed abolition, objected to the interference of the men in the management of the undertaking. The men said they did not mind the meters, but they did not want the bonuses; but the bonus was the key to the whole situation. Without the bonus the men had no interest in keeping down the consumption of energy. So far as the utility of the scheme was concerned, he might tell them that they had one driver who cost the department 12s. per week more for energy than another man working the same route. He moved that the bonus scheme be retained. Mr. Dunlop said only 12 men on the whole system had got the bonus and the merit badge. After a long discussion, the amendment to retain the bonus was lost, and then the question was referred to the Council in Committee.

TELEGRAPH and TELEPHONE NOTES.

Automatic Telephony.—The number of localities now served by automatic telephones in America is 131; of these networks, 30 have fewer than 100 stations, 94 more than 100, and six have the following numbers:—San Francisco, 16,500; Los Angeles and Oakland, 24,000 and 8,000 respectively; Grand Rapids, 11,000; Columbus, 14,000, and Portland (Oregon), 12,000. The network at Chicago is under construction. The aggregate of subscribers is 200,000. On the Continent of Europe this system is in use in the following cities: Hildesheim, Altenburg and Munich, in Germany, and at Graz and Cracow, in Austria. At Amsterdam a semi-automatic system is in course of installation. At Munich the Bavarian Postal Authorities intend gradually to transform the existing manual offices, so that in a few years' time the automatic system alone will be used to serve the 20,000 or 30,000 stations. In Austria it is intended to substitute the semi-automatic system for the manual in the central offices at Vienna. In this country the system is being tentatively tried by the Post Office.

France.—For some months past (says *Le Temps*) a lively activity has been shown in the establishment of wireless stations in French oversea possessions. Stations are in course of construction at Konakry and Tabou, in West Africa; six stations are being built on Lake Chad (Central Africa), two stations on the Congo, stations at Kien An and Hanoi, in Indo-China, and two portable stations. In Madagascar a large station is being built at Diego-Suarez, and the stations at Mayotte and Majunga are being refitted with the "singing-spark" system. About 8,000,000 fr. are being expended on these several works.

Germany.—A wireless station is in course of construction at Königsburg, in Prussia. The wireless station at Chingtau, in the German possession in China, built in 1906, is to be re-equipped with the "singing-spark" system, the range being also increased from 200 to 600 km. The cost is estimated at 150,000 marks.

New Cable.—The cable ship *François Arago* recently left Calais for Libreville, to lay a new submarine cable between that port and Pointe-Noire.—*Journal Télégraphique.*

Norway.—The Storthing has voted for the extension of the telegraph system, 53,000 kroner; for telephone construction, 817,200 kr.; and for a wireless station near Bergen, 80,000 kr., as well as 300,000 kr. for the erection of wireless stations near Hammerfest and on Spitzbergen. The total vote amounts to 1,250,200 kr.—*Electro.-Nachrichten.*

Russia.—The Government has drafted a Bill regarding the reorganisation of the wireless telegraphic system under State control.

Sweden.—A wireless coast station has been established at Gothenburg, on the German system, for public service. It has a range by day of 1,200 km., and by night of 2,000 km. The tariff is 14 cents per word, and the lowest charge for a telegram is 1·40 fr.

Telephone Rents.—Sheriff Mackenzie, in the Glasgow County Court, has issued an important judgment in connection with an action by the National Telephone Co. against a local firm. Pursuers asked for £5, being the annual subscription which became payable by defenders on April 20th, 1911, for an instrument and telephone circuit, according to an agreement entered into between the parties, dated April 22nd, 1903. The defence, in effect, was that the National Telephone Co. had entered into a contract with the Post Office for the transference of their business to the Post Office as at December 31st, 1911, and that they were therefore not in a position to carry out their contract with the defenders. His Lordship gave decree for the sum sued for, with 15s. costs.

The Telegraphic Union Memorial.—The *Journal Télégraphique* for October 25th reports the proceedings of the international jury appointed by the Swiss Federal Council to adjudicate upon the 106 designs submitted in the second competition for the erection of a monument at Berne to commemorate the foundation of the Telegraphic Union. The jury, by a majority, awarded the first prize to the design of G. Romagnoli, of Bologna; the second, third and fourth prizes, of 6,000, 5,000 and 4,000 fr. respectively, were allotted to the designs of Chev. G. Bianconi, of Turin; Als. de Buele and V. Vaerwyck, of Ghent; and J. Muellner, of Vienna; and a sum of 1,250 fr. was awarded to each of two French and two German schemes. In conformity with the verdict of the jury, the Federal Council resolved to entrust the execution of the work to the winner of the first prize.

The Telephone Transfer.—In the Parliamentary Papers Mr. Duncan Miller asked the Postmaster-General whether, after the transfer of the National Telephone Co.'s undertaking to the Post Office, the Post Office would pay local rates on the undertaking or an equivalent contribution in lieu thereof based upon the annual value of the undertaking as appearing in the valuation roll. Mr. Herbert Samuel replied that the Government was prepared to authorise some contribution in lieu of rates on the National Telephone Co.'s undertaking after December 31st next, but the precise basis of the contribution had not been settled.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—NEW SOUTH WALES.—December 20th. One branching multiple magneto switchboard at Broken Hill, for the P.M.G.'s Department. See "Official Notices" September 22nd.

VICTORIA.—November 28th. Ebonite earpieces, calculagraphs, and insulators for the P.M.G. See "Official Notices" October 6th.

December 12th.—Ebonite earpieces, telephone cords, bronze and copper wire, Bleeck-Love cells and charges, and telephone material, for the P.M.G.'s Department. See "Official Notices" October 20th.

Canada.—LETHBRIDGE.—November 24th. Municipality. Power station equipment, comprising boilers, economiser, steam turbo-generator, condenser and sub-station equipment; 10 per cent. deposit with tender. Plans, &c., from A. Reid, superintendent engineer, Lethbridge.

Darwen.—Re-ventilating St. John's Church by the electrical fan system. F. Ramsbottom and J. T. Ainsworth, wardens.

Dublin.—November 9th. The Corporation is inviting tenders for electrically-driven centrifugal pumps for the Ringsend pumping station.

November 6th.—General stores for a year, for the Dublin United Tramways Co., Ltd. See "Official Notices" October 13th.

Great Western Railway.—November 7th. Stores for a year. See "Official Notices" October 6th.

India.—November 14th. The Secretary of State for India is inviting tenders for rails and fishplates and electric cranes, &c. Director-General of Stores, India Office, Whitehall, S.W.

London.—L.C.C.—November 6th. Stores for a year. See "Official Notices" October 20th.

New Zealand.—February 7th, 1912. Napier Corporation. (1) Permanent way, overhead work and supply mains; (2) power station, car-shed and repair-shop equipments; (3) rolling stock. Deposit 2½ per cent. Specifications can be seen at the Board of Trade Commercial Intelligence Branch in London.

Norway.—January 31st, 1912. The Norwegian military authorities in Christiania are inviting tenders for the supply of 100 sets of field telephone apparatus.

Radcliffe.—November 7th. Two 300-KW. rotary converters and transformers, and E.H.T. switchgear for the U.D.C. See "Official Notices" October 20th.

Salford.—November 27th. Two 1,000-KW. direct-current turbo-generators, for the Corporation. See "Official Notices" to-day.

Sheffield.—November 13th. One 5,500-KW. steam turbine, condensing plant, pumps, pipework, &c., and alternator and exciter, for the Corporation. See "Official Notices" October 13th.

Siam.—December 30th. Tenders are invited for five electrically-driven centrifugal pumps for the waterworks at Bangkok. Particulars, Local Sanitary Department, Bangkok.

Spain.—Tenders have lately been invited by the municipal authorities of Valencia del Mombuey (province of Badajoz) for the concession for the electric lighting of the town during a period of four years.

Stretford.—November 13th. Electric mains and accessories, for the U.D.C. Mr. R. Rowland, electrical engineer (returnable deposit of £2 2s.).

Swindon.—November 22nd. One 250-KW. Diesel oil engine generating set, accessories, switchgear, &c., for the Corporation. See "Official Notices" to-day.

Uruguay.—February 6th, 1912. Tenders are invited by the Port Authorities at Monte Video for the supply of 13 electric cranes, together with 600 metres of steel rails. For further particulars, see this column last week.

Warrington.—November 17th. Telegraph materials and carbons, for a year, for the Cheshire Lines Committee (form No. 6). Stores Superintendent, Cheshire Lines, Warrington.

CLOSED.

Accrington.—The T.C. has accepted the following tenders :—

Messrs. Ferranti, Ltd.—Switchgear for sub-station, £143.
British Westinghouse Co., Ltd.—300-K.V.A. three-phase transformer, £180.

Belgium.—Ten concerns—four German, three Belgian, one French and two British (the British Insulated and Helsby Cables, Ltd., and W. T. Henley's Telegraph Works)—last week submitted tenders to the Belgian Post and Telegraph Authorities in Brussels for the supply of a quantity of six-conductor submarine cable, the lowest offer being that of the Société des Ateliers de Constructions Electriques, of Charleroi.

Chelmsford.—The T.C. has accepted the tender of the Electric Supply Corporation, Ltd., for a 1½-H.P. motor and direct-coupled centrifugal pump, at £33.

Hastings.—In the list of tenders for the lighting of the Workhouse in last week's issue, *Sherland* Bros. was a mistake for *Sherratt* Bros.

Leigh.—The Electricity Committee has accepted the tender of the Astley and Tyldesley Colliery Co., for 40,000 tons of best slack at 9s. per ton delivered at the electricity works, and during the period covered by the present contract at 8s. 6d. per ton.

London.—L.C.C.—The Highways Committee recommends for acceptance the tender of Messrs. Kirk & Randall for the erection of buildings for a permanent-way depôt at Poplar, at £14,325.

SOUTHWARK.—The B.C. has accepted the tender of the Western Electric Co., Ltd., at £85, for the supply of 220 yards of 2 cable.

STEPNEY.—The following tenders were received by the Electricity Committee for a transformer for testing high-tension cables in connection with Wapping sub-station :—

Johnson & Phillips, Ltd.	£60
Brush Electrical Engineering Co., Ltd.	61
British Electric Transformer Co., Ltd. .. .. (accepted)	73
Siemens Bros. Dynamo Works, Ltd.	95

Mansfield.—The T.C. has accepted the tender of the Sherwood Colliery Co. for coal for the electricity works for a year.

Morecambe.—The T.C. has accepted the tender of Mr. J. W. Pearce for doubling the tramway track to Bare, at £3,773.

Westinghouse Contracts.—The following are some of the important orders recently received by the British Westinghouse Electric and Manufacturing Co., Ltd. :—

Sir Wm. Arrol & Co., Ltd.—One 60, two 50, six 35, two 12, five 10, and four 2½-H.P., 220-volt motors and spares.
Hulse & Co., Ltd., for Japan.—Various type "G" motors and panels.
Strakers & Love.—One 174-H.P. slip ring motor and liquid starter.
Royce, Ltd.—Two 25, two 15, two 10, and two 6-H.P., 400-volt, two-phase, 50-period motors and control gear.
Linde British Refrigeration Co., for Bristol Dock, Avonmouth.—Two 45, two 7½, and three 7½-H.P. 500-volt "G" motors.
War Office, for Gibraltar.—One 20, one 15, one 12, three 10, and two 7-H.P. motors.
Gold Coast Machinery and Trading Co., Ltd.—Two 70 and three 15-H.P. 200-volt, two-phase, 50-period A.C. motors and control gear.
Wigan Coal and Iron Co., Ltd.—Six 30 and three 10-H.P. motors and control gear.
Cowans, Sheldon & Co., Ltd.—Four 30-H.P. motors and control gear.
Huddersfield Corporation.—Transformers and switchgear.
Baroda State Railway.—Transformers and switchgear.
Rhymney Iron Co.—Transformers.
Greenock Corporation.—Two 500-KW. rotaries, transformers, switchgear.
Staveley Coal and Iron Co.—One 400-K.V.A. transformer and six type pillars.
Bury Corporation.—Transformers.
Bradford Corporation.—Transformers.
Tennant & Barrs.—One electric winder.
Stothert & Pitt, for Bristol Docks.—Equipment for nine 2-ton electric cranes for Avonmouth, nine 40, nine 12, and nine 6-H.P., 500-volt motors, control gear and spares.
Rochdale Tramways.—Eleven brake equipments.
Walter Bros. & Co., for Botafogo Mill.—Electrical equipment for Fabrica de Tecidos Botafogo.
Brush Co., for Rochdale Tramways.—Twenty-four controllers.
Babcock & Wilcox, Ltd.—One 400-KW. rotary converter and switchgear.
C. W. Fairweather.—One 550-H.P. A.C. motor starter, &c.
East Indian Railway.—One 82½-KW. A.C. generator, exciter, switchgear, &c.
Tennant & Barrs, for Ford Paper Works, Ltd.—One 65-H.P. 200 FB motor controller with resistance, and one 75-KW. transformer, panel and wiring.
Noyes Bros., Sydney, for Dunedin.—Six car equipments.

Newport (Mon.).—The tender of Messrs. A. G. Arnold and Son, Newport, has been accepted for the electric light installation at St. John's Church.

Stafford.—The T.C. has accepted the tender of Callender's Cable Co., at £2,010, for the supply and laying of 3,000 yards of electric cable, the cost of the cable being £1,671.

Stalybridge.—The Stalybridge, Hyde, Mossley and Dukinfield Tramways and Electricity Board has accepted the tender of the British Westinghouse Co., Ltd., for the supply of a 3,000-KW. turbine.

Stoke-on-Trent.—The T.C. has accepted the tender of the Shelton Iron, Steel and Coal Co., Ltd., for Great Row slack to the Hanley electricity works for a year, at 8s. 5d. per ton.

Wolverhampton.—The T.C. has accepted the tender of Messrs. Edgar Allen & Co., Ltd., at £155, for the supply of a cross-over with rolled-steel rails and manganese centres, for Victoria Street.

FORTHCOMING EVENTS.

Junior Institution of Engineers.—Saturday, November 4th. At 7 p.m. At Caxton Hall, Westminster. Reception by the President, Sir J. J. Thomson, and Lady Thomson.

Society of Engineers (Inc.).—Monday, November 6th. At 7.30 p.m. At the I.E.E. Paper on "Two-Cycle Engines," by Mr. R. W. A. Brewer.

Institution of Electrical Engineers (Manchester Local Section).—Tuesday, November 7th. At 7.30 p.m. At the University, Manchester. Paper on "The Mechanical Design of Direct-Current Turbo-Generators," by Mr. R. Roberts.

Rontgen Society.—Tuesday, November 7th. At 8.15 p.m. At the I.E.E. Presidential address.

Institution of Civil Engineers.—Tuesday, November 7th. At 8 p.m. Presidential address by Dr. W. C. Unwin, and presentation of medals and prizes.

British Electrical and Allied Manufacturers' Association.—Thursday, November 9th. At 2.30 p.m. At 36, Kingsway, W.C. Meeting of the Council.

Institution of Electrical Engineers.—Thursday, November 9th. At 8 p.m. Presentation of premiums, and paper on "Modern High-Voltage Power Transformers in Practice, with Special Reference to a 'T' 3-unit System," by Mr. W. T. Taylor.

Institution of Electrical Engineers (Birmingham Local Section).—Friday, November 10th. At 7 for 7.30 p.m. At the Grand Hotel, Birmingham. Annual dinner.

Physical Society.—Friday, November 10th. At 5 p.m. At the Finsbury Technical College. Papers on "Physiological Effect of an Alternating Magnetic Field," and "Demonstrations of Acoustical Experiments, New and Old," by Prof. S. P. Thompson, and other papers.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—COL. H. M. LEAF.

The following orders are issued :—

Monday, November 6th.—"A" Company. Company work, 7 to 9.30 p.m.
Tuesday, November 7th.—"B" Company. Company work, 7 to 9.30 p.m.
Wednesday, November 8th.—Gymnastic classes, 7 to 10 p.m.
Thursday, November 9th.—"C" Company. Lecture, 7 p.m. Technical work and infantry drill, 8 to 10 p.m.
Friday, November 10th.—"D" Company. Lecture, 7 p.m. Technical work and infantry drill, 8 to 10 p.m.
Saturday, November 11th.—Fort Coalhouse, week-end run. The party will parade at Fenchurch Street Station at 3.10 p.m. Dress: Service dress, greatcoats, haversacks and belts; no arms will be taken.

(Signed) P. H. CAMPBELL, Capt. R.E., Adjutant for O.C. London Electrical Engineers.

NOTES.

Electrical Fatality.—An inquest was held at Southwark upon the body of George Salter Windeatt, aged 29, who died from injuries received at the City of London generating station, Bankside, where he was employed. Windeatt had been in the employ of the company for 14 years, and it appeared from the evidence that he went to work as usual on October 10th, and, while "making dead" a switchboard on one of the top galleries, he was heard to fall. He was found lying in front of one of the switches, with his clothes alight. On the way to Guy's Hospital, he said, "I know how it happened; I took out the wrong length." On examination of the board it was found that he had quite correctly pulled out two lengths of wire, but he had omitted to pull out the switch. The gear was therefore still "alive." He was not wearing the india-rubber gloves which were necessary. Death took place a few hours after his admission to the hospital, and was due to extensive burns and shock.—The jury returned a verdict of "Death from misadventure."

Accident.—An evening paper says that just before mid-day on Tuesday, an arc lamp outside a cinematograph theatre near Oxford Circus fell and injured a man on the head. He was taken to the Middlesex Hospital.

Lighting of Workmen's Dwellings at Eccles.—We have received from Mr. H. W. Angus the following abstract from his report to the Eccles Electricity Supply Committee: The second year's supply of electrical energy to the Corporation Road houses was completed on September 30th last, and I have pleasure in giving the following detailed particulars of the metered quarterly consumptions of electrical energy, which have been charged for on one of our standard rates, namely, on the first hour's supply per day at 7d. per unit, and all further supply at 2d. per unit:—

Quarter ending.	Total B.T.U. consumed.	Max. recorded rate of supply demanded.	Units at 7d.	Units at 2d.	£ s. d.
Dec. 31, 1910 ...	428	·700 B.T.U.	64	364	4 18 0
March 31, 1911 ...	345	·683 ,,	62	283	4 3 4
June 30, 1911 ...	178	·692 ,,	63	115	2 15 11
Sept. 30, 1911 ...	199	·725 ,,	66	133	3 0 8
	1,150				£14 17 11

The Health Committee has paid £14 17s. 11d. for the electrical energy consumed by their tenants during the 12 months. On the other hand, the income received by the Health Committee from their tenants was as follows:—12 houses at 6d. per week for 12 months, £15 12s.; less empties during the year, 23 weeks at 6d. per week, 11s. 6d.—£15 0s. 6d. The Health Committee have therefore made a slight profit on the transaction. This result, which is a repetition of the satisfactory result obtained during the first 12 months' supply, strongly confirms the original object for which this experimental lighting has been carried out, namely, to demonstrate that the cost of electric lighting need be no obstacle to its general adoption in small dwelling houses.

With reference to the cost of lamp renewals which the tenants of the houses have paid for, this has not been a great expense, as only eight new lamps have been supplied to the tenants of the 12 houses during the 12 months. The cost of these lamp renewals works out at an average of 1s. 8¾d. per annum for each tenant.

Electric Railways in Sweden.—It is estimated that the waterfalls in the possession of the Swedish State represent a total of 700,000 H.P., and this fact has tended to create considerable interest in the question of the introduction of electric traction on the State railways. Electrical working on the Northern Frontier Railway from Gellivare-Kiruna to Riksgransens, which will be 80 miles in length, is to be completed in 1914, and if expectations entertained in regard to it are fulfilled, the conversion of other State lines will be carried out. The State already owns a power station at the Trollhatten Falls, which has been equipped with plant of 80,000 H.P., and it would be possible to supply power from this station to the railways in West Gothland, Bohuslan and Dalsland. Instructions have already been given by the Government to the special water-power authority and the electrical department, to investigate the question as to the transformation of the Gothenburg-Alingsas section, which has a length of 28½ miles. The railways in the neighbourhood of the capital are also thought likely to be converted to electric traction in the near future, and the preliminary works in connection with the erection of a power station for this purpose at Elfkarleby, which is about 90 miles distant from Stockholm, are being actively pursued at the present time. The station is to be equipped with plant, having an output of 40,000 H.P. As far as concerns the Northern Frontier Railway previously mentioned, work is being carried on at high pressure in regard to the line, the power station at Porjus, and the line to connect Porjus with Gellivare. The railway forms a link of a projected line which would proceed from Oestersund to Gellivare, and would be 560 miles long. The schemes provides for the utilisation of various waterfalls in connection with the working of the railway, of which the most southern portion—Oestersund-Strom—is already in course of construction for a length of 68 miles.

Electric Driving of Textile Factories.—In a Presidential address to the Belfast Association of Engineers at their opening meeting last week, Prof. Stanley dealt with the subject above-named, and spoke of the remarkable development which had taken place during the current year in the application of the individual electric drive. Last year not more than 300 motors, he said, had been used for this purpose; now they were being installed in large Lancashire, Yorkshire and Scottish mills in hundreds. Since January one electrical manufacturing firm had supplied about 2,000 motors for this purpose, and had in hand inquiries involving a further 5,000. In Germany there were over 50,000 looms driven by individual motors, and this system was also largely adopted in America. Recent progress was entirely along the lines of individual drive, which was, with some few exceptions, most suitable for every class of textile machinery, but peculiarly so for loom driving. There was no doubt that the three-phase alternating-current motor was far superior to the direct-current motor for most classes of textile machinery, spinning or weaving. Printing machinery was probably best suited by direct-current motors, and spinning frames by single-phase repulsion motors. If the distributing mains of an electric supply company were not available, the best prime mover to adopt was the steam turbine, whose even turning torque, transmitted faithfully by the induction motors, would enhance both the quality and quantity of the finished material. In any case the induction motor would give a far steadier drive than any other method. These motors were now made totally enclosed, and therefore not interfered with by dust or nap. They ran on ball bearings, and could if necessary be cooled by air draught in floor ducts, so as to avoid any interference with the requisite humidity of the atmosphere in which they worked, as in spinning rooms. If the full benefits of electric drive were to accrue, care must be taken that each machine was fitted with a motor of the exact size suited to its requirements. After enumerating the unquestionable advantages of electric driving in connection with the lay-out and running of a mill, Prof. Stanley stated that the increase in production as the result of electric driving in one Lancashire mill was estimated from results at from 12 to 18 per cent., and the quality of the yarn was also improved. The time was ripe, he thought, for starting a large central electric power supply in the centre of industry in the north of Ireland, as electrification of the factories was bound to come, and to come soon. The adoption of electric driving would lead to a revolution in the design of some textile machinery—especially looms—within the next five years. We are indebted to the *Belfast News Letter* for the foregoing extract from the address.

Tests of an Oerlikon Turbo-Generator.—A 3,000-KW. turbo-generator, supplied by the Oerlikon Co. to the Société Lyonnais des Forces Motrices du Rhone for their stand-by station at Cusset, was recently tested, and the results may be of interest. The generator was specified to give a normal continuous output of 3,000 KW. at a power factor of 0·65, and 3,500 KW. for two hours with the same power factor. The turbine was constructed to run at 1,500 R.P.M. with steam at 220 lb. pressure per sq. in., at a temperature of 350° C. The condensing plant was of the Paris Westinghouse Co.'s make, consisting of a surface condenser and rotary air, circulating and force pumps, coupled direct to a 72-B.H.P. Oerlikon steam turbine running at 1,500 R.P.M. The steam consumption includes that of this small machine.

Four tests were made, two at half load, one at full load, and one at 20 per cent. overload. The steam pressure was about 210 lb. in each case, and the temperature about 350° C. The vacuum varied from 97·8 per cent. at the lower loads to 97·1 at the highest. Other data are as follows:—

	½-load.	*½-load.*	*Full load.*	*1½-load.*
Total steam consumption in lb. per hour	20,827	20,779	38,799	45,749
Three-phase output in KW.	1,555·8	1,594·9	3,165·6	3,574·9
Power factor	0·675	1·0	0·665	0·715
Steam consumption per K.W.H. at above power factor (excluding excitation) in lb.	13·37	13·02	12·25	12·80
Power consumption for excitation in KW.	18·48	18·57	21·12	22·88
Steam consumption per K.W.H. at power factor unity, including excitation, but excluding condenser power, in lb. ...	12·38	12·32	11·62	12·19

Except in the second test, the power factor was unusually low, and the comparatively low efficiency of the small auxiliary turbine also affected the results adversely; the latter took at full load 3·3 per cent., at half-load 6 per cent., and at overload 2·9 per cent. of the total steam consumption. Making due allowance for the power factor, condensing plant, and excitation, the corrected values given in the last line of the above table, it is claimed, represent the lowest steam consumption figures as yet recorded under similar conditions; and this in spite of the fact that the generator, built for a p. f. of 0·65, had to be abnormally large compared with a machine designed for a p. f. of 0·8.

Institution and Lecture Notes. — NORTHAMPTON INSTITUTE ENGINEERING SOCIETY.—On October 20th a paper entitled "Electric Lamp Filaments" was read before the Society by Mr. N. E. Paine. The author detailed the processes employed in the manufacture of the modern carbon and metal filaments. The manufacture of Nernst filaments was also described, followed by the results of tests on and costs of lamps per 1,000 C.P.-hours, which, including the cost of lamp, work out as follows, reckoning electricity at 3d. per unit: Carbon, 13·8d.; tantalum, 7·0d.; tungsten, 4·79d. The next meeting of the Society will take place to-day (November 3rd) at 5.45 p.m., when Messrs. T. R. Houston and F. G. Parnell will read a paper on "Diesel Engines."

INSTITUTION OF ELECTRICAL ENGINEERS (MANCHESTER SECTION).—The first meeting of the session was held on October 27th, when Mr. W. Cramp delivered his inaugural address as chairman. About 200 members and friends were present.

Mr. Cramp announced that it was proposed to hold a conversazione on December 15th, which would be organised jointly between this section of the I.E.E. and the Manchester Association of Engineers. As a means of broadening the scope of the discussions on the various papers, it had been arranged to have a joint meeting with the Liverpool Engineering Society, at Liverpool, on November 15th, when a paper would be read by Dr. Marchant on "The Function of the Laboratory in the Training of an Engineer," and also with the Manchester Association of Engineers on January 27th, 1912, when a paper would be read by Mr. Cecil Myers on "Electrical Furnaces." It was hoped that the joint meetings would benefit the members to a greater degree by affording a better discussion from the different points of view of the members of the three societies.

The meeting afterwards took the form of a smoking concert, which was much enjoyed by those present.

ASSOCIATION OF TEACHERS IN TECHNICAL INSTITUTIONS.—The annual meeting of the Association will be held at the Borough Polytechnic, S.E., to-morrow (November 4th). The annual report of the Council, which will be considered at this meeting, deals with the large increase in the membership of the Association in the past year, and with the work done during that period. Branches

have been formed in Ireland and Wales, so that the activities of the Association now spread over the whole kingdom. After the consideration of the report a discussion will be initiated on the Board of Education Examinations in Science, by Mr. C. F. Smith, Manchester School of Technology, and Mr. J. Wilson, Battersea Polytechnic. To this discussion visitors are invited. Particulars can be obtained from the Hon. Secretary, Mr. P. Abbott, the Polytechnic, Regent Street, W.

Association of Mining Electrical Engineers.—The first meeting of the Session in connection with the Notts. and Derbyshire Branch was held at Nottingham on Saturday, when a visit was paid to the Corporation electricity works. Mr. W. Maurice (President), speaking subsequently, stated that the Association had a membership of about 900, and he confidently anticipated that before the year ended it would have reached 1,200.

At a meeting of the Yorkshire Branch at Leeds University, on Saturday, Mr. E. K. Scott referred to the danger of over-legislation regarding the application of electricity to coal mining. He said that unless care was taken the new Mines Bill, so far as it concerned electricity in mines, might have the effect of the Electric Lighting Act of 1882, and scotch all progress. It would shut down some of the collieries of Yorkshire, which could not be worked except by electrical machinery. Prof. Bowen, of Leeds University, gave an explanation of the Holmes-Ralph gas-detecting portable electric lamp, and Mr. E. K. Scott afterwards read a paper on the use of electricity in the manufacture of high explosives.

The Institution of Civil Engineers.—The Council has made the following awards in respect of papers published in Section II of the *Proceedings* for the Session 1910-11: Telford Premiums to Messrs. S. M. Dixon, M.A., B.A.I. (Birmingham), H. J. F. Gourley, B.Eng. (London), J. Holden (London), A. Rogers (Horsell), A. E. Griffin (Hong Kong), F. C. Lea, D.Sc. (Birmingham); and a Crampton Prize to Prof. W. E. Dalby, M.A., B.Sc. (London). It has also awarded the Indian Premium for 1911 to C. E. Capito (Ahwaz, Persia), and the Webb Prize to F. W. Bach (London).

Faraday Society.—A special meeting is to be held on Wednesday, November 8th, at 8 p.m., at the Institution of Electrical Engineers, Victoria Embankment, W.C., when Dr. Edward G. Acheson, of Niagara Falls, will give an account of his researches. The address will be accompanied by experiments. Dr. Acheson has been invited to dine with the members of the Society at 6.30 p.m., before the meeting, at the Holborn Restaurant. Non-members will be admitted by ticket, to be obtained by application to the Secretary, 82, Victoria Street, Westminster, S.W.

Institution of Electrical Engineers (Glasgow Students' Section).—Mr. W. W. Lackie addressed the members at the opening meeting of the session, dealing with the transformation of energy in coal to electrical energy. He stated that, after allowing for losses, they found that not more than 250 B.Th.U. per lb. of coal were available in the form of electrical energy. Their present consumption in the T.C. works was about 3 lb. of coal per unit, so that they got 9·5 per cent. of the energy of the coal at consumers' terminals. To transform the electrical energy in 2 lb. of coal, and deliver it in the form of electrical energy to a consumer in Glasgow, meant, at the present time, an initial expenditure of £50, and an annual expenditure by way of interest and depreciation of £4, as well as £3 12s. 5d. for running costs. It was often said that if they had a Niagara Falls at their doors, they would have a much cheaper supply of electrical energy; but they would realise that the water-power drive merely eliminated the coal bill, and often meant the laying of high-tension mains considerable distances. In some generating stations where there was a continuous steady load all day long, and larger units than they had in Glasgow, there was a consumption of 2 lb. of coal per KW.-hour, and this would mean that the amount of energy at consumers' terminals would be increased from 9·5 to 14·2 per cent.

Institution of Electrical Engineers (Yorkshire Local Section).—At the Hotel Metropole, Leeds, on Wednesday, November 15th, Mr. T. Harding Churton, the chairman, will deliver his inaugural address.

Junior Institution of Engineers.—On October 30th a paper on "Notes on Design and Construction in Gas Works" was read by Mr. George Evetts. The presidential address of Commendatore G. Marconi, LL.D., D.Sc., on "Engineering Considerations in Wireless Telegraphy," is to be delivered on November 28th. Tickets for the meeting are obtainable from the Secretary, 39, Victoria Street, Westminster.

Wallsend Exhibition.—An Industrial Exhibition is being held on November 8th, 9th and 10th in the Skating Rink, Wallsend, the largest hall on Tyneside. We understand from Mr. H. W. Clothier, hon. secretary, that it is sure to be of particular interest to electrical engineers who happen to be in the district.

Inquiry.—A correspondent asks for the addresses of makers of iron or steel sheets for transformers.

Durable M.F. Lamps.—Messrs. Pope's Electric Lamp Co., Ltd., have received a letter from a customer who voluntarily says that their metal-filament lamps "have given great satisfaction, and *their great strength* is proved by the way they stood in a fire in this city. When the joists burnt, the roof and contents of three floors crashed down on to the first floor; on the ground floor there were a number of Pope metal-filament lamps hanging from the ceiling, and they stood the tremendous jar so well (*and they were cold*) that none were in any way damaged." As a result this customer is now installing Pope lamps in theatre battens and footlights, considering that if they would stand that fire, they will stand any rough theatre treatment.

The Royal Mint.—The forty-first annual report of the Deputy-Master and Comptroller, the Right Hon. W. G. Ellison Macartney, shows that during 1910 the coinage in the precious metals considerably exceeded that of any previous year. The rapid increase in the demand for gold coin in recent years resulted in the production of more than 27,000,000 pieces, a figure 5,000,000 in excess of that of any previous year, and large concurrent home and Colonial demands for silver, notably for West Africa, brought the total number of silver pieces struck to nearly 52,000,000, or nearly 11,000,000 more than any former total. In all about 153,000,000 pieces were produced, and the net profit on the operations of the Mint for the year was over £1,500,000.

In the newly-erected silver melting house gas has been adopted as a fuel in place of coke, and a saving of 2d. (in the case of gold) per cwt. melted has been effected, the present cost being 5d. per cwt. melted, as against 7d. when coke was used. The crucibles are found to stand on an average 50 per cent. more heat.

The memorandum of Mr. Rigg, superintendent of the operative department, states further that preliminary experiments have been in progress since 1909 as to the best type of furnace to adopt, and that gas, oil and electric furnaces were tested.

The latter type was not found practicable, as, even had the cost of working such a plant as the requirements of the Mint demanded not been prohibitive, the difficulty of recovering the entire charge daily for accounting purposes, and the inability to stir the alloy effectively—an essential condition in the case of bullion for coinage—would have rendered this type of furnace unsuitable.

The oil furnaces, burning both petroleum and creosote oils, tested, were tried under a variety of conditions, and with air pressures varying from 2 lb. to 25 lb. per sq. in. Although it seemed clear that, at present prices, the oil fuel is more economical than coke, the higher economy usually necessitates a higher pressure for the efficient atomising of the oil, and the noise caused thereby constitutes a grave objection to the process, while the need of an extensive storage for the maintenance of a continuous supply presented serious difficulties.

In the experiments with ordinary town's gas, a variety of systems was tested involving the use of gas at ordinary and high pressure, combined with variations in the pressure of air. The problem presenting itself for solution was the reduction of the combustion chamber to the smallest practicable dimensions, so as to concentrate the heat on the crucible of metal. The experiments undertaken clearly indicated that efficient combustion, combined with comparative silence, depended very largely on the correct formation of the burner nozzle and the fire-brick extension thereof. The type of furnace adopted was designed in the Mint, and the burner ultimately decided on was made by Mr. S. N. Brayshaw, of Manchester. Gas is taken from the main at ordinary pressure and mixed with air at 2 lb. per sq. in. pressure. The noise from these burners can be reduced sufficiently to be unobjectionable, and the furnace linings compare very favourably with those used for coke in regard to durability.

The new silver melting house has been provided also with two entirely electrically-driven travelling cranes of 5 and 10 cwt. capacity respectively, and is lit by four Westinghouse silica lamps. In connection with the recent Treasury Authority, whereby the Mint is required to undertake the preparation of dies and plates for the printing of adhesive stamps, an electro-depositing plant has been installed. Up to the present all plates are of copper deposit and iron-coated, but nickel is to be substituted, and preparations are in progress for carrying out this change.

The general increase in the work of the department in the year under review has occasioned an increase in the number of motors in use from 73 to 86, and the average monthly output of the main generators has risen from 22,841 units in 1909 to 26,193 in 1910.

The memorandum of Dr. T. K. Rose, chemist and assayer, states that during the year the electrolytic method for the determination of traces of lead in brittle gold has been adopted.

If proper precautions are taken, the platinum anode is distinctly coloured by lead dioxide when 0·02 per 1,000 of lead is present. The quantity of gold required for the analysis is only 10 grammes.

A German Peat-Electric Plant.—At the East German Exhibition in Posen, recently held, there was exhibited a peat gas plant in working, built for the Görlitz Machine Works and Iron Foundry. The gas was extracted from the turf by a specially devised generator and supplied direct to a gas engine. From investigations made by Prof. Baer, of the Royal High Technical School, of Breslau, it appeared that at a price of 4 marks per ton of turf, the KW.-hour, measured at the switchboard, would cost only 0·6 pfennig. At a lower rate for the turf, obtained by the use of machinery, viz., 2 marks per ton, it is calculated that the cost per KW.-hour might be lowered one-half, viz., to 0·3 pfennig.

Osnabrück, in Hanover, is one of those places where the feasibility of electric lighting by means of turf gas is being demonstrated, the town being lit by current generated at the turf-gas station at Schweger Moor, 28 km. distant. It is intended to extend the supply to Wittlage, Damme-Bersenbrück and Diepholz.

Level-Crossing Fatality.—In the case of the death of Miss S. Johnson (27), nurse, of New Brighton, who was killed at Hall Road Station, on the Liverpool-Southport electric section of the L. & Y. Railway, a verdict of "Accidental death" was returned at the inquest on October 30th, and the jury added the opinion that the laxity of the company in not prosecuting persons who had openly broken the by-laws by passing over this level-crossing (where the young woman was killed), and so given a tacit consent to such a breach, might have conveyed to deceased that she had a right to go over the crossing.

A Long-Suffering Lamp.—A user recently informed the British Westinghouse Electric Co. that he had had one of their 25-volt 16-c.p. metallic-filament lamps in use for nearly three years, near a gas oven: the fumes from the latter had eaten completely through the brass cap, showing a degree of venomous animosity that one would hardly have expected even from gas; but the filament of the lamp is still intact, and the glass bulb has not been blackened at all.

A Rubber Testing Plant.—The North-British Rubber Co., of Edinburgh, whose manufactures are well-known in the electrical trade, have just equipped a new electrical laboratory at their works. It is an important department of the new building just erected for laboratory experimental purposes. The most interesting feature in the electrical department is the installation of high-tension resistance apparatus for testing the dielectric strength of the numerous products they make in connection with the electrical industry. Here, rubber gloves and vulcanite goods, of which the Castle Mills give a large yearly output, are subjected to insulation resistance tests, all of these products being guaranted to withstand the voltage specified. This apparatus is capable of giving a test up to 20,000 volts pressure, the current being generated in the power house attached to the laboratory. A suction gas engine drives two dynamos of high and low voltage, and supplies electric light, and also power to the motors for testing machines, mills, &c., in the experimental department, and stirrers, &c., in the physical and chemical laboratories.

Tramway Claim in the House of Lords.—In the House of Lords this week the case of Leaver (pauper) *v.* Pontypridd Corporation was heard. It was an appeal by the widow of a painter, whose death she alleged was due to the negligence of the driver of a tramcar belonging to the respondent Corporation. The defence was that there was no evidence of negligence. As reported in the *Standard*, the action by the widow was tried at the Cardiff Assizes. At the close of the plaintiff's case, the defendants' counsel submitted that no negligence had been shown on the part of the driver. Mr. Justice Pickford rather thought that was so, but he left the case to the jury, so as to avoid the cost of a new trial, and reserved his decision as to the evidence for further consideration in London. The jury, after hearing the defendants' case, awarded the widow £275. On further consideration, the learned Judge held that there was no evidence of negligence on the part of the driver, and entered judgment for the defendants. The Court of Appeal affirmed his decision; hence this appeal to the House of Lords. The Lord Chancellor said that he thought the appeal must succeed. Negligence was a question for the jury, not for the judge, and if he had been a juror he thought he should have agreed with the jury that there was evidence of negligence on the part of the driver. Drivers of tramcars on a narrow road such as that between Pontypridd and Treforest, where this accident happened, ought not to take risks, but should stop and make sure that there was a clear way before attempting to pass something on the road which left the margin of only a few inches. If a jury found in any reasonable way that the accident was due to the driver's negligence it was the duty of the Courts to sustain the verdict of the jury. The other noble and learned lords expressed concurrence, and the appeal was accordingly allowed.

Motor-Car Lighting.—An interesting exhibit at the Motor-Car Exhibition at Olympia is a new electric lighting equipment shown by Messrs. S. Smith & Son, 9, The Strand, London, W.C., and produced by them in conjunction with the British Thomson-Houston Co., Ltd., of Rugby. The equipment, with the exception of the instruments, is of British design and construction. The dynamo differs from those at present on the market in that it is of an ordinary type with no subsidiary poles or mechanical governors. The patented electrical control is an ingenious piece of mechanism, and a constant output of 8 amperes is supplied to the accumulator whether the speed of the motor be 12 miles or 50 miles an hour.

Appointments Vacant.—Assistant electrical engineer for the P.M.G.'s Department, Melbourne (£520 to £600); electrical engineer, for the Bispham-with-Norbreck U.D.C.; assistant superintendent of railway telegraphs, for the Government of South Nigeria (£300). See our advertisement pages to-day.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—The Perth Corporation Electricity Committee has agreed to increase the salary of MR. LAMBERT, the engineer, by £25, in view of the rearrangement regarding the tramway management.

At the Fleetwood Council's Electricity Works, on October 26th, MR. J. M. GARSTANG, senior shift engineer, who is leaving to take up a better position with the Cleveland and Durham Electric Power Co., was presented by colleagues with a leather kit bag. Mr. W. Humphreys, on behalf of the staff, made the presentation.

The employés of the Oldham Electricity Works have presented a clock, barometer, and pocket wallet to MR. W. J. CARTER, on his marriage. Mr. Carter has been appointed chief assistant engineer at the Batley Electricity Works.

MR. J. R. WILSON, second engineer-in-charge at the Ilford electricity works, has been promoted senior engineer in place of Mr. H. H. Arthur, resigned. MR. G. A. PARTINGTON, switchboard attendant and assistant fitter, has been appointed fourth charge engineer.

MR. J. H. CAWTHRA, borough electrical engineer, South Shields, has resigned that office, having been appointed to an important position on the staff of the Victoria Falls and Transvaal Power Co., Ltd.

General.—MR. LANE'S TESTIMONIAL.—The first smoking concert of the Electro-Harmonic Society, now in its twenty-sixth season, held on Friday evening, the 20th ult., was marked by the presentation to Mr. W. E. Lane, the popular hon. secretary, of a handsome cabinet of table cutlery, &c., as a recognition of the esteem and regard in which he is held by the members, and to celebrate the occasion of his recent wedding. Mr. Robert Kaye Gray, the chairman, made the presentation, and in a few eloquent and well-chosen remarks paid a high tribute to the manner in which Mr. Lane had carried out his secretarial duties, which involved so much voluntary labour and time on his part. Mr. Lane, in reply, said that on this memorable occasion in his life he could hardly plead that the whole affair had rendered him speechless with surprise, for it had for some months been an open secret that he was about to join the noble army of martyrs, yclept Benedicks, and he became aware that a few of his older friends in the Society intended to mark the event by some recognition of his long connection with Electro-Harmonic functions, it being just 10 years since he was appointed hon. secretary to the Society. The growth of membership during those years by over 100 per cent. naturally augmented his duties to a considerable extent, especially so far as financial matters were concerned, but he was happy to say that the discharge of these duties was of no consequence to him compared with the great and genuine pleasure which the Society had, for more than a quarter of a century, regularly afforded an ever-increasing number of members and their friends. His long connection with the Society had been a source of unfeigned gratification to him, and his relations with the Committee, the treasurer, and especially with the musical directors, had been of the friendliest and happiest nature, and he did hope that it was generally felt by all that he had always endeavoured to the best of his ability to carry out his duties to their complete satisfaction, the interests and welfare of the Society being his one and only object. The handsome testimonial with which he had been presented that evening would be one of his most highly prized possessions, and would serve to remind him of many, many never-to-be-forgotten Electro-Harmonic evenings, and also go to show that he was happy in numbering many more friends than he ever thought he possessed. The gift would be cherished not so much on account of its intrinsic worth, valuable though it was, as for the kindly feeling which prompted it. He finally expressed his grateful thanks to the Committee, the subscribers and the organisers of the testimonial and to the chairman for the graceful and touching manner in which his services had been eulogised—services which to him had ever been a labour of love, and which he hoped to be allowed to continue for so long as he was called upon to do so. Mr. Lane then resumed his seat amidst great applause. One amongst Mr. Lane's manifold duties, we noticed, was, perhaps purposely, left untouched. We know from long experience that the collecting of subscriptions from forgetful members is not a wholly congenial task, and if, after repeated applications, Mr. Lane has felt compelled to show the iron fist within the velvet glove, we are sure that it has never been done with the smallest intention of hurting in the slightest degree the personal feelings of the defaulting member, be he never so hardened a sinner.

We learn that MR. W. C. MOUNTAIN is retiring from the firm of Ernest Scott & Mountain, Ltd., and proposes to devote himself to consulting electrical and mechanical engineering in connection with mining installations, also inspections, valuations, settlements of claims, arbitration in commercial disputes relating to electrical and engineering matters, &c. During the last few days he has been appointed arbitrator by the Coal Trade to represent a number of the principal counties of England in connection with the use of electricity in mines. Mr. Mountain has been appointed consulting engineer to the Warwickshire Coal Co., Charlaw and Sacriston Collieries, Houghton Main Colliery Co., Burradon and Coxlodge Coal Co., Ltd., Hamsterley Colliery Co., James Ross and Co., and several others. He has taken offices at Sun Buildings, Newcastle-on-Tyne. Mr. Mountain's practical experience in colliery and works electrification, and general engineering work, runs back over some 36 years. It may be remembered that he acted as electrical expert to the Mining Association of Great Britain in connection with the 1905 inquiry into the use of electricity in mines. He will carry with him into his new operations the good wishes of a host of electrical friends.

The *Times* reports that SIR JOHN and LADY GAVEY were among the passengers in the R.M.S.P. *Amazon*, which left Southampton on October 27th for Brazil and the River Plate.

Mr. J. R. Garner, for eight years works manager of the Electric and Ordnance Accessories Co., Ltd., Aston, Birmingham, has resigned in order to take up a similar position with the Lancashire Dynamo and Motor Co., Ltd., Manchester. On Friday evening, October 27th, a farewell smoking concert, held at the King Edward Hotel, Aston, was made the occasion of a presentation to Mr. Garner by the departmental heads, outside selling staff, foremen and certain of the staff (about 200 in all), of a specially-designed roll-top desk, as a mark of the esteem and respect they had gained for him during his able control of the manufacturing side of the business. The presentation was made by Mr. J. D. Morrison (secretary and commercial manager), who prefaced the actual presentation by a eulogistic account of Mr. Garner's character and his many good points—points which had gained for him everybody's respect, and had raised the company from the "slough of despond" to a highly satisfactory position in the electrical industry. Mr. Morrison was ably supported by Mr. A. Watkins (chief inspector for 10 years), who, as an instance of the feeling for Mr. Garner in the works, showed how the pattern-makers had given up their spare time to make a model (or, as the foreman pattern-maker called it, "a pup of the real desk") of the desk. The formal presentation was then made, the desk being represented by the above-mentioned model. At the same time, Mr. Morrison asked Mr. Garner to accept, on behalf of Mrs. Garner, a silver rose bowl. In his reply, Mr. Garner expressed his appreciation and thanks.

Mr. Cecil Partridge, the present traffic manager, has been appointed manager of the Central London Railway. Nine years ago Mr. Partridge entered the service of the company as assistant traffic superintendent, having previously been with the Great Western Railway Co. for 12 years.

The marriage took place on Thursday, October 26th, at Egremont, of Mr. Theodore S. Schontheil, the eldest surviving son of Mr. Simon Schontheil, Ph.D., and a member of the firm of Haslam & Schontheil, of Cardiff, electrical engineers, with Miss Mary Constance Jones, the younger daughter of the late Mr. W. Price Jones, of Liverpool. Mr. Harry Ellis, the deputy city electrical engineer of Bradford, was the best man.

Mr. R. H. Willis, of the British Electric Plant Co., Alloa, has been appointed Secretary of the East of Scotland Branch of the Association of Mining Electrical Engineers in room of Mr. Thos. Davidson, Edinburgh, who has received an appointment in Southern Nigeria.

A Smoking Concert and Social was held on Saturday evening last at the Crow's Nest Hotel, Newcastle-on-Tyne, to bid farewell to Mr. Geo. T. Todd, who is severing his connection with Messrs. J. H. Holmes & Co., electrical engineers, Newcastle-on-Tyne, with whom he has been connected for a period of 23 years. Mr. Todd is taking up a position of responsibility with Messrs. Javori & Co., merchant shippers, Manchester. The chair was occupied by Mr. J. Parmley Graham, and on behalf of the staff, Mr. W. A. Clatworthy formally presented Mr. Todd with a mahogany roll-top desk. The firm also presented Mr. Todd with a solid silver tea service. Songs, &c., were rendered by members of the staff and other friends, and a very enjoyable evening was spent, a most hearty send-off being given to Mr. Todd.

Owing to the increase of Messrs. Mawdsley's business in the Lancashire district, Mr. G. B. Lowe has relinquished his other agencies, and will in future devote the whole of his services to the sale of their "Zone" patent dynamos and motors manufactured at Dursley.

Mr. H. Mayer, the principal of the late firm Messrs. H. G. Mayer & Co., has joined the staff of the Globe Electric Co., Ltd.

Obituary.—Mr. J. C. Fuller.—We regret to record the death of Mr. John Crisp Fuller, which occurred last week, in his 91st year. Mr. Fuller's name is well known in connection with his bichromate battery. Born at Bristol in 1821, he came early to London when the railways were beginning to spread their lines over the country, and when the newly-formed Electric and International Telegraph Co. had just commenced its operations. From that time right down to a few weeks ago he had taken a keen interest in electrical matters, and his name has become known to electrical engineers in all parts of the world. In the early days he came into close contact with telegraph pioneers, most of whom pre-deceased him, and he took constant pleasure in the fact that he was associated as a temporary assistant with Michael Faraday. About the year 1854 Mr. Fuller joined the Electric and International Telegraph Co., and when the transfer to the Post Office took place, he received a cheque from the company as a souvenir of the work he had done in improving their batteries. Among others with whom he worked were Mr. Edwin Clark, Mr. Latimer Clark, and Sir William Preece. All the details of the electric telegraph system had to be studied and worked out as the scheme developed. The batteries were always a troublesome and important matter. At first, what was called the Sand Battery was used with zinc and copper elements and sulphuric acid, but it was found troublesome and ineffective. Mr. Fuller adopted the Daniell sulphate of copper battery, and arranged it in the trough form which is so well known on English railways. This battery was used until Mr. Fuller invented the bichromate battery, when it gradually went out of use. One of the results of his early studies of batteries was the invention of the system of battery working then called the Universal battery system, by which one set of cells worked a whole group of circuits. This plan in later years has been greatly extended, and all large centres are now worked by it. Very few of the younger generation of electrical engineers however, know, when they speak of a Common battery, that it emanated from the fertile brain of Mr. Fuller. The growth of electric telegraphs as a commercial enterprise constantly called for new appliances, and Mr. Fuller's inventive faculties had full scope. His first patent for batteries was taken out in 1853. He invented a gravity form of manganese cell, and his leather division sulphate cell has continued to be used until last year or so. All the details of the early electric telegraph system came under his attention. Although he was not engaged laying the early submarine cables, the landlines and apparatus at the sea shore were under under his supervision. In about 1857 he assisted Messrs. Silver & Co. (the founders of the India-Rubber, Gutta-Percha and Telegraph Works Co.) in applying india-rubber to telegraph purposes. Here he designed the machines and methods for covering wire, and made vulcanite insulators, of which vast numbers were used at the time. Later, and previous to founding his own firm of electrical engineers, he assisted Mr. W. T. Henley, the submarine cable manufacturer. At this time he invented and patented the mercury bichromate battery, which is so largely adopted in all English-speaking countries, especially America. This battery came at a time when only the sulphate with its one volt was known. The bichromate cell with its2 volts, inexhaustible quantity and economy of number of cells and space, came as a boon to all telegraph workers. But we understand that although this battery has been so largely used in America, Mr. Fuller never derived any pecuniary benefit from its use there. He had a very varied and active life, and at the age of 90 was still able to take a share in the control and management of the business of Jno. C. Fuller & Son.

Mr. W. C. Martin.—Mr. Wm. C. Martin, senior partner of the firm of Messrs. Wm. C. Martin & Co., electrical engineers, Glasgow, died at his residence in Glasgow on Sunday morning. For the past two years Mr. Martin had been in indifferent health which militated against his giving much personal attention, either to his own or to public business, though he was out and about on Friday last. As a young man he entered the service of the Telephone Co., of London, and in 1882 took up a position with the British Electric Light and Power Co. In 1883 he went to Glasgow, and ten years later started in business for himself, identifying himself with all branches of electrical engineering. It was, however, in work aboard ship that the firm specialised, and they secured and carried through contracts for electrical installations on the Cunard liner *Mauretania* and many other liners and vessels. He was a member of the I.E.E. and of the Institution of Engineers and Shipbuilders in Scotland. For the past three years Mr. Martin served as a representative on the Town Council, where he rendered much service in connection with the tramways and electricity departments of that body.

The death occurred on Saturday of Mr. Thos. Dewhurst, at Blackburn, in his 67th year. Mr. Dewhurst joined the old Magnetic Telegraph Co. in 1858, being stationed at Preston. He entered the Post Office service at the time of the transfer in 1860, and went to Blackburn as clerk in charge of the telegraph department in 1878. In 1893 he became superintendent of the telegraph department, a position he held until his retirement in 1898.

We regret to learn of the death, at his residence in Leeds, on Sunday morning, the 29th ult., of Mr. J. S. MacGregor, permanent way engineer for Messrs. Thermit, Ltd. Mr. MacGregor, who was known to many of our readers, had been unwell for some time, and had been confined to his house for the past six months.

CITY NOTES.

B.E.T. Reorganisation of Capital.

We recently suggested that Mr. Garcke would be well advised in taking representative shareholders in the B.E.T. Co. into the confidence of the board, and we are glad to notice, from a circular dated October 28th, which has been addressed to the proprietors, that the directors have conferred with certain representatives in regard to the scheme, which has already appeared in these columns, and upon which we have made some comments. The result of the conference between the shareholders and the directors has been productive of a modified scheme, which will be submitted for approval at the adjourned meetings to be held on November 3rd, as already arranged. It will be remembered that one of the principal defects in the original scheme consisted of the interference with the present rights of the shareholders as to equality of capital, which under the new scheme are undisturbed.

The following represents the provisions of the modified scheme:—

Each £10 6 per cent. cumulative preference share	To be exchanged for	£2 10 0 6 per cent. cumulative preference stock	No priority to capital.
		£5 0 0 7 per cent. non-cumulative preference stock	
		£2 10 0 6 per cent. preferred ordinary (non-cumulative) stock	
		£10 0 0	

Non-interest bearing income certificates it is proposed to issue to the amount of £266,371, being the arrears of dividend upon the existing preference shares. These certificates it is intended to issue to the registered holders of such preference shares on November 3rd, 1911, in proportion to the number of preference shares held by them respectively. They are to be redeemable out of the profits available for dividend and remaining in each year after payment of the dividends upon the cumulative preference and non-cumulative preference stock to the extent of an amount equal to that paid by way of dividend for that year upon the preferred ordinary stock of the company and *pari passu* therewith. The amount so available for the redemption of the income certificates is to be applied to the purchase of such certificates in the market, or by tender, in either case under par or by drawings at par.

Each £10 ordinary share	To be exchanged for	£5	0	0	6 per cent. preferred ordinary non-cumulative stock	No priority to capital.
		£5	0	0	Deferred ordinary stock entitled to all profits in any year after the cumulative preference, non-cumulative preference, income certificates, and preferred ordinary stocks	
		£10	0	0		

As we have stated on previous occasions, the possibility of any dividend for distribution among the preferred and deferred ordinaries seems to us remote, and unless Mr. Garcke can secure promotion profits and render productive the large amount of unproductive investments which the company possesses (£1,679,007), the scheme seems to be doomed to disappointment. Shareholders do not want intangible vistas or prospects, nor do they require promotion profits in preference to a steady reliable income from investments sufficient to pay a reasonable dividend upon the share capital of the undertaking.

Having regard to the transcending importance of depreciated values, and of the reserves, the only remedy appears to be that of cutting down the capital of the company in a manner equitable to the interests of the share classes concerned.

The scheme now proposed is not a remedy. As the present nominal capital of the company is £4,000,000, divided into £2,000,000 in £10 preference shares, and £2,000,000 in £10 ordinary shares, it will be seen that if the new arrangement be carried out, the capital will become :—

£500,000 cumulative preference stock.
£1,000,000 non-cumulative preference stock.
£1,500,000 preferred ordinary stock.
£1,000,000 deferred ordinary stock.

£4,000,000

Marconi's Wireless Telegraph Co., Ltd.

Mr. G. C. Isaacs presided at Watergate House, Adelphi, W.C., on Wednesday last week, over an extraordinary general meeting of the above company. The chairman having apologised for the absence of Mr. Marconi, who was abroad, said that the meeting was called for the purpose of considering, and, if thought fit, passing a resolution to increase the company's capital by 250,000 ordinary shares of £1 each, ranking *pari passu* with the ordinary shares of the company previously authorised and issued, to enable the directors to turn to the fullest account the fresh opportunities offering in this industry. In Russia, and in the East generally, there was a big field for development, and they had secured the controlling interest in the Russian Co. of Wireless Telegraphy and Telephony, which had been in existence for some two or three years, and was carrying out large contracts for the Russian Government, and negotiating for further contracts of considerable magnitude. Captain Adrian Simpson, a member of the company's staff, had been appointed managing director of the Russian company, and Mr. Marconi and he himself were joining the board. In other parts of the world they are conducting negotiations which should mature in the early future, and would require considerable financial resources. They were satisfied that the additional resources for which they asked the authority would be productive of such increased profits to the company that both the preference and ordinary shareholders would be substantially benefited. They were in active negotiation with the British Government in connection with the great scheme of Imperial wireless stations, and hoped that the near future would enable them to announce that the construction of these stations was about to be commenced. They had just received a cable from Chile informing them that their offer for the construction of a number of stations for the Chilian Government had been accepted. They had been able to arrive at a settlement of all their differences with the Lodge-Muirhead syndicate, and would henceforth have the advantage of Sir Oliver Lodge being associated with their company as a scientific adviser. By this arrangement they had broken the back of the litigation through which it was necessary for them to pass; there remained little more to be done in that direction in this country. If the meeting approved the resolution which he would formally submit, and if it were confirmed at the meeting summoned for November 9th next, the directors would quickly proceed to make the necessary arrangements for the issue, fixing the premium at which the new capital would be issued. Shareholders might, however, rely that these terms would provide for a reasonable substantial bonus to both preference and ordinary shareholders alike. He moved—"That the capital of the company be increased by the creation of 250,000 new ordinary shares of £1 each, to be issued on such terms and conditions as the directors think fit, such shares to rank *pari passu* in all respects with the existing 500,000 ordinary shares of £1 each."

Major Flood Page seconded the motion.

Mr. Goodway asked if the whole of the capital was required to be used at one time.

The Chairman said that was a question he could hardly answer at the present time. It must be left to the directors to do what was necessary at the time.

Mr. F. M. Davies asked if any of the capital was going to be used for the practical isolation of the company's stations at Poldhu and Glace Bay.

The Chairman said he could best answer that question by saying that a portion of this new capital would undoubtedly be used for creating a telegraphic service with a number of stations and under which the stations at home would undergo certain changes.

Mr. Davies said his object in asking was that he looked upon the American trade as a gold mine. He had tested the stations on two consecutive days, and one message took five hours to cross and the other 30.

The Chairman said in so far as the wireless system was concerned, their messages went across practically instantaneously, and the only difficulty they had to contend with was the landlines. That was a question which was receiving their very careful attention, and it was, of course, of very material importance. Until they could complete arrangements in connection with the landlines, they were unable to get any continuous or reliable improvement in the dispatch of messages so far as the landlines were concerned. He had received messages which came over in 50 minutes, but it depended on the landlines.

Mr. Davies said it depended on their enemies. They had a gold mine in the American trade, but everything was in the hands of their enemies, so far as the land wires were concerned.

Mr. Hodgson asked what proportion of the new issue would be given to the preference and what to the ordinary shareholders.

Mr. Goodway remarked that he had used the Atlantic service and found it very satisfactory, although, of course, there were times when messages were delayed. He found that if he sent over a message early in the morning he got a reply by six at night, and they did not want anything more rapid than that.

Mr. O'Brien observed that as a London stockbroker he used the system, and it was perfectly satisfactory.

Mr. W. J. Purdie said he had been in communication with quite a number of users of the wireless system, and in all cases they had expressed satisfaction.

The Chairman said that with regard to Mr. Hodgson's question, both classes of shareholders would be in the same position.

The resolution was then carried unanimously.

An extraordinary general meeting will be held at Watergate House, York Buildings, W.C., on Thursday, November 9th, when the resolution passed at the extraordinary general meeting on October 25th will be submitted for confirmation as a special resolution.

Auckland Electric Tramways Co., Ltd.

The fourteenth ordinary general meeting was held on Monday at the Electrical Federation Offices, Kingsway, Mr. C. G. Tegetmeier in the chair.

The Chairman, in moving the adoption of the report, congratulated the shareholders upon the continued progress and prosperity of the company. The traffic receipts had amounted to £210,167, notwithstanding that there had been no increase in their route mileage during the year. That £210,167 was an increase of £22,754 over the previous 12 months, and showed the very high figure of £9,000 per mile over the whole of their 23 route miles of line. The passengers carried increased from 29 millions to 33 millions. The increased spending power of the community, which this evidenced, must be ascribed to the growth and the progress of Auckland, which it had been his good fortune to refer to on previous occasions. With the progressive policy of the Auckland City Council and the other local authorities in the development of the exceptional natural advantages that Auckland had been favoured with, they might confidently anticipate that this growth and progress would be continued. The large increase in the traffic receipts had naturally been accompanied by a considerable increase in the expenses, and though there had been no extension of their lines during the year they had, in order to meet the requirements of the community, run a very much larger number of car-miles. Their expenses were undoubtedly high, a very large portion of them consisting of wages, and it had to be borne in mind that the cost of wages, and also the cost of material in Auckland, were very much

larger than we were accustomed to in this country. On the other hand, the higher scale of wages that prevailed in all industries in New Zealand was reflected in increased tramway travelling. Thus Auckland, with its population of approximately 100,000, spent £2 per head in tramway traffic, an amount which was probably four times as much as would be considered a satisfactory figure in this country. They carried the whole of the population about 33 times in the course of the year. The profit and loss account showed that on maintenance and repairs they had spent the large sum of £40,227, of which £21,880 was spent upon their rolling stock and £8,170 upon the upkeep of the permanent way. In addition, they spent a further sum of £5,339 upon renewals, the latter amount being chargeable to the depreciation account, which was created for the purpose of meeting the varying expenditure of this nature from year to year. The expenditure on renewals during the year was comparatively low, but with the increasing age of their undertaking, they must expect that item to have an increasing tendency, and that they would have to meet very considerable outlay in the near future. The time, of course, came when the work of repairs and maintenance of plant and equipment and permanent way had to give place to complete renewal. The cost must come out of revenue, and it was essential that they should have accumulated out of past reserves a sufficient fund to meet the expenditure when the need should arise. Out of the surplus of last year they had provided for renewals in the future to the extent of £20,000, and they believed they were providing adequately for the renewals and reconstructions that would have to be carried out in future years. With the £20,000 transferred from last year's revenue, the depreciation account would stand at £58,577. The profit and loss account also included the rental and percentage of profit paid to the Auckland City Council under the deed of delegation, amounting to £4,718. The total sum accruing to the Auckland City Council out of the company's profits since the commencement of their operations had amounted to nearly £30,000, and he thought the City Council must regard it as satisfactory that that result had been attained without any risk or outlay on their part. Their debenture and other interests amounted to £16,877, and after providing for that and all other expenditure chargeable to revenue, they had a surplus of £43,574. With the £6,073 brought forward, they had a total of £49,647 available for distribution. They proposed to transfer out of this sum £15,000 to the reserve fund. The dividend on the preference shares required £3,000, and they recommended that £24,500 should be applied in the payment of a dividend on the ordinary shares at the rate of 7 per cent., of which an interim dividend at the rate of 3 per cent. for the year was paid last May. The capital expenditure amounted to £65,148, the largest portion of which was spent upon additions to the rolling stock and extensions of the power-house plant. At the date of their last balance-sheet they had 91 cars in stock. During the year they added eight and at the close of the year 16 more cars, orders for which had been given many months previously, were approaching completion. In view of further requirements for the future and with the possibility of similar delay, they ordered in June last 10 more cars, which were now in an advanced stage of construction. At the present date they had 111 cars in stock, and in the course of a few months that number would be increased to 126, which represented an increase of 34 cars in less than two years. He referred more particularly to this question of rolling stock, because the Auckland City Council thought it fitting last August to serve them with a 60 days' notice under the deed of delegation of their intention to take action against the company in respect of an alleged shortage of cars. They disputed that there had been any shortage of cars. The extensions to their power-house plant had also been of considerable magnitude. At the last meeting he told them that they had ordered a 1,000-KW. set which would bring their plant capacity to a total of 3,750 KW. That set was shipped to Auckland some months ago, and was now probably erected and at work. That gave them ample provision for present needs and for the near future, but in view of the marked expansion of the traffic, they had thought it wise to take a very liberal estimate of their future power requirements, and they had placed an order for another 1,000-KW. set, which was in course of construction, and which he hoped would be shipped to Auckland in the course of another month or two. Another matter involving considerable capital expenditure had been the provision of car-shed accommodation for the large increase in the number of their cars. A very extensive enlargement of their Epsom depôt had been carried out at an approximate cost of £20,000. At the last meeting he referred to the Tramways Amendment Bill which had been introduced by the New Zealand Government into the Houses of Parliament, and which had been the subject of considerable controversy. The Bill eventually became law, and under its provisions very wide powers in connection with the operation of the tramways were vested in the Government. They had not yet seen the regulations to be issued by the Government under the Act in the form they would ultimately take, but they had no reason to anticipate that they would be of a character to prejudicially affect the working of their undertaking. Since the passing of the Act they had obtained the necessary approval of the Government to the adoption of the air brakes with which they proposed to equip the whole of their cars, and the work of installation had now been practically completed, at a cost of £10,000. The various items of capital expenditure had necessitated the raising of further capital. Their last previous issue of capital was in 1909, when they placed £50,000 in ordinary shares. Since then their capital expenditure had amounted to nearly £130,000. They had been saved the issuing of capital to the full extent of their capital expenditure by using their reserve funds for the purpose, but since the close of the financial year they had made an issue of 50,000 new preference shares. For the future they had £100,000 of debenture stock available for issue, which placed the company in a very strong financial position. The item, real estate in Auckland, appeared in the balance-sheet at £2,008. In the previous balance-sheet it was £19,601, and it consisted of freehold property known as Alexandra Park, upon a portion of which their Epsom car-shed was built, and the freehold site of their other car depôt. During the year they had sold the portion of the Alexandra Park property which was not required for the purpose of the company's business at a price which gave them a surplus of £1,761. That surplus had been transferred to the reserve fund, which now stood at £66,671. A recent valuation of the sites of their two car depôts, which formed their real estate in Auckland, showed a very considerable surplus over the amount at which the item appeared in the balance-sheet. With regard to future probable extensions of their lines, they might expect that as the outlying districts of Auckland developed, extensions would be urged upon them. The original concessions acquired by the company consisted of 18 route miles of line, the first portion of which was opened for traffic in 1902, and they had now over 23 miles of line in operation. At the present time an extension of about one mile in the Mount Albert district was being constructed, and other extensions of somewhat greater length were in contemplation. He was glad to say that the prospects for a continuance of the favourable results shown last year were good. In concluding, the chairman paid a tribute to the services of the local directors, and said that, at the request of his colleagues, he intended going out to Auckland next month to discuss the company's affairs with the local board and the general manager.

Mr. C. S. Hilton seconded the motion, and the report was adopted.

United Electric Tramways Co. of Caracas, Ltd.

Col. Ivor Phillipps, M.P., presided at the offices, Dashwood House, Old Broad Street, E.C., on October 31st, over the fifth ordinary general meeting of the above company. The proceedings were purely formal, and the report was adopted on the motion of the chairman.

The report stated that during the 12 months ended June 30th, 1911, the operations of the local company (La Compania de Tranvias Electricos de Caracas) were as under :—

	1910-11.	1909-10.	Increase.
Gross receipts	Bs.1,088,981	Bs.1,048,805	Bs.40,176
Operating expenses	627,037	603,843	23,194
Net receipts	Bs.461,944	Bs.444,962	Bs.16,982
At Ex.: Bs.25·25 to the £ ..	£18,295	£17,622	£673

After adding Bs.16,637·05, the balance of profit carried forward from the previous year, to the above net receipts for the year, providing for the mortgage interest payable to this company—viz., £10,200 (= Bs.257,550), and setting aside Bs.50,000 to reserve and renewals funds, the local company are enabled to carry forward Bs.171,031, as shown in that company's balance-sheet, of which a copy was attached to the report. The increase in operating expenses is due to the following causes :—Increased traffic, cost of improving the permanent way and rolling stock, which experience has shown to be necessary, a compensation claim for personal injury, and the higher cost of sending remittances to England. The following table of statistics compares the result of the 12 months 1910-11 with the corresponding period 1909-10 :—

	1910-11.	1909-10.	
Passengers carried	3,752,723	3,573,620	Inc. 179,103
Car-miles run..	899,867	844,905	Inc. 54,962
Percentage of operating expenses to gross receipts	57·58	57·57	Inc. 0·01
Receipts per car-mile	Bs.1·21	Bs.1·24	Dec. Bs.0·03
Operating expenses per car-mile	Bs.0·70	Bs.0·71	Dec. Bs.0·01
Number of cars	41	41	—
Miles of track..	16½	15½	Inc. 1

A new short branch line constructed during the year was opened for traffic in the last week of June, and the working is showing satisfactory results. In compliance with the terms of the trust deed, £900 has been placed to the sinking fund for the redemption of mortgage debenture stock, and £1,050 first mortgage debenture stock has been purchased in the market and cancelled. Mr. Wallis reports that all the company's property is maintained in first-class order, and that the prospects for the present year are very bright.

Germany.—The Berliner Electricitätswerke Gesellschaft, of Berlin, reports a net profit of £536,313 for the last financial year, as compared with £492,467 in the preceding 12 months.

London Omnibus and Railway Amalgamation.—The directors of the London General Omnibus Co., Ltd., on Wednesday provisionally sanctioned proposals for amalgamation of the company with the Metropolitan District Railway Co., and the Underground Electric Railways Co. of London, Ltd., the joint capital being £33,000,000.

Western Telegraph Co., Ltd.—After transferring £140,000 to the general reserve fund, and £10,000 to the land and buildings depreciation fund, the directors recommend a final dividend of 3s. per share, making a total dividend of 6 per cent. for the year ended June 30th, and also the payment of a bonus of 2s. per share, both free of income-tax.

Quebec Railway, Light, Heat and Power Co., Ltd.

The annual report for the year ended June 30th, 1911, of this company, which owns the whole of, or the majority of the stock of the following companies:—The Quebec Railway, Light and Power Co.; The Quebec Jacques Cartier Electric Co.; The Quebec Gas Co.; The Frontenac Gas Co.; The Quebec County Railway Co.; The Quebec and Saguenay Railway Co.; and the Canadian Electric Light Co., shows that the gross earnings for the year were $1,280,127, as compared with $1,127,952 in 1910, an increase of $152,174. The operating expenses were $661,907, as compared with $644,564 in 1910, an increase of $17,343. The net earnings were $618,220, an increase of $134,831 over 1910. After adding miscellaneous income from subsidiary companies' earnings prior to July 1st, 1910, and deducting fixed charges of $456,329, two dividends payable July 15th and April 15th, 1911, amounting to $199,990, organisation expenses of $10,681, and less sundry interest earned of $11,109, there remains a surplus of $62,329.

Quebec Railway, Light and Power Co. (City Division).—The mileage on this division has been increased 26/100 miles. Extensive repairs and renewals have been made and the roadway is in excellent physical condition. Sixteen new cars of the modern "Pay-as-you-Enter" type and 10 open bench cars of standard type were purchased and put in service during the year. Two large sweepers and two snow scrapers were also added. With the enlargement of the car barns at St. Malo, the company has now ample room to accommodate its rolling stock. Provision has been made at these barns for additions to the rolling stock and for the enlargement of these barns when rendered necessary.

Montmorency Division.—During the year the mileage has been increased by 3½ miles of double track road from Beauport to Kent House Park. This extension runs through a thickly settled district and it will be almost immediately remunerative. About two miles of main line have been re-laid with 80-lb. steel rails, the old rails taken up being used for sidings at various points. Additional tracks have also been laid in the yards at the Quebec terminal to facilitate the handling of the increasing freight traffic. The main line has been rebonded during the year with type E.A. electric welded rail bonds, which has greatly increased the efficiency and enabled the maintenance of a much improved service. The roadway is now in excellent physical condition. Forty-eight gondola freight cars, 60,000 lb. capacity; 15 box freight cars, 60,000 lb. capacity, and two passenger motor cars of standard 400 class, have been added to the equipment during the year, while one electric locomotive No. 6, constructed in the company's shops, has been in operation for some time with good results. A new sub-station has been constructed at Ste. Anne de Beaupré, and the following additional equipment installed therein:—One 500-KW. motor-generator set with exciter and transformers. A new transmission line has also been constructed from Montmorency Falls to Ste. Anne de Beaupré, and the voltage increased from 10,000 to 25,000 volts, thus effecting a considerable saving. The company's hotel at Montmorency Falls Park, known as "The Kent House," has been enlarged and refurnished throughout. A number of new attractions have been added to the equipment of the Montmorency Falls Park, and some of these have already proved profitable as well as serving to induce people to visit the park.

Quebec County Railway Co.—The construction of this railway was commenced in July, 1910, and the road opened for operation in September, 1910. The earnings of this line have fully warranted the expenditure incurred in its construction. The line runs from Maple Avenue westward through St. Cyrille Street in Montcalmville, and through private right-of-way and streets in the Municipality of St. Columba de Sillery to the top of Sillery Hill, a distance of 2½ miles, and is double-tracked throughout its entire length. The line passes in close proximity to the St. Patrick's and Mount Hermon Cemeteries, which are visited daily by a large number of people. Under agreement a through service is operated over the lines of the city division to the post office in Quebec.

Power and Light Division.—The work of consolidating the various power supplies at the Queen Street sub-station is being proceeded with. It is expected that this work will be completed in a few weeks' time, and in addition to enabling the company to utilise power from any one or all of its hydraulic stations a considerable saving in labour and other charges, will be effected. During the year a contract was entered into with the Municipality of Ste. Anne de Beaupré for street lighting for a period of 10 years, and a 10-year renewal contract for street lighting was closed with the town of Levis. A renewal for 10 years for the supply of power to the Levis County Railway was also completed at a somewhat increased price. The overhead lines have been extended in various districts to take care of the increasing business.

A feature of the financial report is the substantial increase in gross earnings of $152,174, with an increase in operating expenses of only $17,343. The various extensions, improvements and economies made during the year will only commence to bear fruit during the present year, and will be reflected in the next annual report. It is expected that the company's new office building, which is being erected in the heart of the city at the corner of Crown and St. Joseph Streets, will be ready for occupation very early in the New Year.

City of Buenos Ayres Tramways Co. (1904), Ltd.—The directors have declared a dividend of 1s. 3d. per share, less income-tax, for the three months ended September 30th.

Mexican Light and Power Co., Ltd.—The daily Press states that an offer will shortly be made of £1,000,000 5 per cent. second mortgage 50-year bonds.

Sunderland District Electric Tramway, Ltd.

The sixth annual general meeting of this company was held on October 26th, at Winchester House, E.C.

The Chairman (Mr. H. R. Hogg), in moving that the report, briefly mentioned in our last issue, be received and adopted, mentioned that Mr. Charles Eves, chartered accountant, was appointed Receiver by the Court on the suit of the prior lien and of the first mortgage debenture-holders almost immediately after the last meeting, and three of the directors—Mr. C. S. Cockburn, Mr. Charles Eves, and Mr. A. U. Green—retired from the board, leaving only two—the Hon. R. Parker and himself—to look after the interests of the shareholders. It had been held by the Court that the Receiver could not be appointed manager also, so the board endeavoured to meet the difficulty by electing Mr. Reginald Taylor to one of the vacant seats. The track-miles open and in use were 16 miles. The directors were formulating a scheme for the reorganisation of the company, and they hoped shortly to be able to lay it before the shareholders and debenture-holders for their consideration. They trusted that the scheme would do away with the expensive course the Receiver had now to adopt, and in the end, replace the business in the hands of the shareholders. As the result of strikes in the coal and shipping trades, to which the work of the company was mainly restricted, its business had fallen off rather considerably during the past year, but the board had given its sanction to the Receiver's request to order more cars, and money would be required for the renewal of rails and rolling stock, so that, though the income on traffics had improved, it would require a good deal of economising yet to make ends meet.

The motion was unanimously agreed to.

Prospectus.—*The Toronto Power Co., Ltd.*—The list was to close on Wednesday in an issue of £821,917 consolidated guaranteed debenture stock (4½ per cent.) of the Toronto Power Co., Ltd., guaranteed unconditionally, both as to principal and interest, by the Toronto Railway Co. The price of issue was 96 per cent. The prospectus stated:—"The present issue of debenture stock is being made to provide funds required in consequence of an arrangement which has been effected, whereby the Toronto Railway Co. and the Toronto Electric Light Co. (the two great companies using electricity in Toronto) and the Toronto Power Co. and the Electrical Development Co. (the companies which supply them with electricity) have been brought under one administrative control, and will in future be worked practically as one enterprise, thereby removing from the former companies all anxiety with regard to their supply of power, and providing the latter with a definite permanent market for a large proportion of their output. A continuance of the earnings of the combined enterprises is thus ensured; considerable economies are being effected, and future profits can be reliably estimated."

Rio de Janeiro Tramway, Light and Power Co., Ltd.—A *Times* correspondent at Rio de Janeiro, under date October 12th, writing respecting the Rio de Janeiro Tramway, Light and Power Co., Ltd., a Canadian company whose securities are held in England to the extent of some £10,000,000, says:—"From time to time the English Press has been furnished from here with reports as to the intentions of a rival concern which proposed to compete with the Light and Power Co. in the supply of electric energy to Rio de Janeiro. Something over a year ago the fact that another concession similar to that of the Light and Power Co. had been granted by the Prefect of Rio caused some comment. The right of the municipality of Rio de Janeiro to make this concession was contested by the Light and Power Co., which obtained from the Courts an injunction preventing its realisation. It will be interesting to the many shareholders of the Light and Power Co. to hear that a few days ago a definite decision was given in this question annulling the rival concession."

Companies Struck Off the Register.—The following companies have been struck off the register, and are accordingly dissolved:—

Formby and Freshfield Electric Light Co., Ltd.
Houldsworth Patent Roller Bearings Co., Ltd.
Light and Heat Exhibition (1895), Incorporated.
Macclesfield Electric Lighting and Power Co., Ltd.
Penarth Tramway Syndicate, Ltd.
Phœnix Electric Heating Co., Ltd.
Rotary Engine Co., Ltd.
Standard Turbine Co., Ltd.
Trade Exhibitions Co., Ltd.

The following companies will, unless cause is shown to the contrary, be struck off the register within three months, and will accordingly be dissolved:—

Aluminium Manufacturing Co., Ltd.
British Electric Co., Ltd.
Rubberite, Ltd.

New St. Helens and District Tramways, Ltd.—The accounts for the year ended June 30th show a profit, including £390 brought forward, of £2,622. The directors recommend a dividend of 2½ per cent. on the preference shares, leaving £624 to be carried forward.

Metallic Seamless Tube Co., Ltd.—At a meeting of the shareholders held in Birmingham on Friday, October 27th, a dividend was declared of 7½ per cent. on the ordinary shares, and a final dividend at the rate of 6 per cent. upon the preference shares, for the year ended June 30th last.

Hobart Electric Tramway Co., Ltd.

The report of the directors for the year ended December 31st last shows that the company's business continues to exhibit a steady expansion under nearly all heads, and the gross revenue for the above period amounted to £29,724, which is the largest total the company has yet received, and marks an increase of practically £2,000 as compared with 1909. A comparison with the gross receipts for the year 1900 shows that the company's income has more than doubled during the intervening ten years. For the first half of the current year the gross receipts are well in advance of those for the corresponding period of last year. The profit on Hobart working account amounted to a total of £12,361. Deducting therefrom debenture interest and London expenses, and adding amount on hand after payment of last year's dividend, there remains a balance to the credit of revenue account of £10,752. The board declared a dividend at the rate of 6 per cent., free of income-tax, which was paid on July 1st last. They recommend that £5,000 be now transferred to the insurance, compensation, debenture premium and general reserve fund, raising that fund to a total of £10,000, and that the balance be carried forward to next year's account. An additional generator set was ordered from Messrs. Siemens Bros. Dynamo Works, Ltd., and has been duly installed. A block of freehold land with the buildings thereon adjoining the company's premises in the rear was purchased for the sum of £6,095, including cost of transfer.

The annual meeting was held at 353, Mansion House Chambers, E.C., on Wednesday last week, the Hon. Alfred Mattei presiding.

The Chairman, in moving the adoption of the above report, said the steady growth in traffic and other receipts was still continuing. For the first 37 weeks of this year their tramway receipts amounted to £21,108, as against £19,303 during the same period last year, representing an increase of £1,805 for less than three-quarters of the year. There was, therefore, little doubt that last year's record would be easily beaten by the same date of 1911. Their net profit for the year on working amounted to £1,236, and after paying debenture interest, &c., there was left a total for division of £8,610. They had in addition a sum of £2,142 on hand representing undivided profits brought forward from the previous year, and by adding these they had a total of £10,752 to be dealt with. To strengthen the position of the company they decided to recommend the transfer of £5,000 to their general reserve fund, so that it would now stand at £10,000. This still left them with upwards of £5,000 to dispose of, so they felt themselves fully justified in declaring a dividend of 1 per cent. more than they did last year, viz., 6 per cent., which, with income-tax, would absorb £3,562. This would leave them with about £2,200 to be carried forward to the present year's accounts It would be quite unnecessary to go on adding as much as £5,000 to their reserve every year, so that even supposing the company did no better than last year, they ought soon to be in a position to consider the question of further increasing the rate of dividend on the shares. They had at the same time taken the opportunity of improving their plant, their permanent way and rolling stock, and the expenditure of energy per car-mile run had been reduced as compared with 1909. In conclusion, the chairman referred to the desire which had been expressed at a meeting of the citizens of Hobart to acquire the tramways, which question, he said, had also been taken up by the Hobart City Council and referred to in the Tasmanian Parliament. Any proposition made to them to sell would be very carefully considered by the board, and if found to be of such a character as they were likely to accept, a general meeting would be called to consider the matter.

Mr. D. Barclay seconded the motion, and the report was adopted.

Cuba Submarine Telegraph Co., Ltd.

The eightieth ordinary general meeting of the shareholders of the above company was held on Wednesday last week, at the offices, 58, Old Broad Street, E.C., Mr. George Keith presiding.

The Chairman, in moving the adoption of the report (Electrical Review, page 654), said that the traffic passing over the company's cables during the half-year had been well maintained, and although the month of April showed some falling off, which might be attributable to the early harvest, it was more than counterbalanced by the good results of some of the other months. The half-year's traffic receipts amounted to £18,554, or an increase of £434 as compared with the corresponding period of 1910, while the total income amounted to £20,774, or an increase of £598. On the other side, the London expenses were somewhat less owing to the re-arrangement of the staff, but the expenses at stations were £388 more in consequence of the increased cost of the maintenance of lines, mainly due to the erection of a new cable house at Batabano, which replaced the old one which was completely wrecked and washed away during the cyclone in October of last year. The total working expenses came out at £6,455, or £255 more than in the corresponding half-year. The result of the half-year's business was a profit of £14,318, out of which £2,500 had been added to the special reserve against loss on investments, and £4,000 had been added to the general reserve fund for the maintenance and renewal of the company's property. After providing for the dividend on the preference shares, the directors recommended payment of the usual dividend at the rate of 6 per cent. per annum on the ordinary shares, and increasing the balance carried forward by £19 to £7,294. The depreciation in the value of the securities was well provided for by the special reserve set aside for that purpose, and the general reserve fund now stood at £124,000. That fund would presently bear the cost of the new cable now being manufactured, which was to be laid between Cienfuegos and Cape Cruz. The vessel with the cable was expected to sail about the middle of next month, and they hoped the new cable would be successfully laid and in working order by the end of the year. The cable would re-establish direct duplicate communication between Havana and Santiago, which would ensure the efficient transmission of through traffic to and from the West Indies. Opportunity would also be taken of the vessel being at Cuba to effect some repairs to the existing cables which, when completed, would leave the company's entire system in perfect working condition. As regarded the current half-year, business generally remained quiet but satisfactory. The latest advices they had received indicated that the present sugar crop was likely to be the largest in the history of the island, and if it commenced early in December, as was expected, he thought the prospects of the company for the present half-year were very favourable.

Mr. C. W. Parish seconded the motion.

Mr. Aronson said he thought the reserve fund had been piled up sufficiently to admit of the ordinary shareholders receiving an increased dividend. He would also like to know how much of the fund would go towards paying for the new cable.

The Chairman remarked that he thought 6 per cent. was a very good dividend for the company to pay under all the circumstances, and the suggestion to increase it had been made at a very inopportune time. They were about to draw on the reserve fund to the extent of, perhaps, £40,000, and it would be the duty of the directors, while maintaining the present dividend, to try and build up the fund again to the figure at which it now stood.

The report was adopted.

Stock Exchange Notices.—Applications have been made to the Committee to allow the following to be quoted in the Official List :—

Para Electric Railways and Lighting Co., Ltd.—Further issue of 5,000 6 per cent. cumulative preference shares of £5 each fully paid, Nos. 129,001 to 134,000.

Calcutta Electric Supply Corporation, Ltd.—The directors have declared an interim dividend on the ordinary shares for the half-year ended June 30th last, at the rate of 7 per cent. per annum, payable on November 15th. Major-General R. H. Mahon, C.B., C.S.I., late Director-General of Ordnance in India, has joined the board of directors of the company.

Ruston, Proctor & Co., Ltd.—The directors have declared an interim dividend at the rate of 5 per cent. per annum, less tax, on the ordinary shares for the half-year ended September 30th.

Kaministiquia Power Co., Ltd.—The directors have declared a dividend at the rate of 3 per cent. per annum on the common stock for the quarter ended October 31st.

STOCKS AND SHARES.

Tuesday Evening.

The Stock Exchange certainly cannot complain this week of lack of interesting features. In many markets there is a great deal more doing, and the voice of the buyer is again heard in the land. Possibly the most sensational item of the last few days is the huge rise in London General Omnibus stock, but there have been other features of considerable public interest, and the Home Railway Market is receiving more attention than it has done for many a long day past.

Home Railway stocks were put up with a rush in consequence of second thoughts proving bullish in regard to the Railway Commission's report. Two or three small, but strong, syndicates were formed to take in hand those stocks in particular where a known bear account existed, and purchases on behalf of these groups were supplemented by a good deal of buying which, in Stock Exchange phrase, was none too good. That is to say, the buyers were punters operating simply for differences—men who at the first indication of prices slipping back rush in pell mell to take their profits. Hence, on talk by some of the Labour leaders about a "General Strike," prices came down with a run, though they have again begun to recover.

Amongst the stocks that benefited most by the boomlet in Home Rails were Brighton Deferred and Metropolitan District Ordinary. The former stock was seized upon by one of the syndicates already mentioned; the latter came into conspicuous prominence by reason of the dramatic rise in London General Omnibus stock. 'Bus stock has risen over 30 points in less than three weeks, going well above 150, before reverting to 145, which compares with 69 as the lowest price touched this year. The buying is said to be based upon demand from a well-known financial house in London, which wants to get control of the company in order to enter into a working agreement between it and the Tube Railway Companies, the latter guaranteeing a dividend of 10 per cent. upon the London General Omnibus stock in consideration of the company consenting

to link up with the Tubes. Some official announcement is imminent, and the point which everyone will look to with the most interest is who the guarantor of the 10 per cent. may be.

On this suggestion, District Ordinary rose 2 points last Saturday morning, but in the subsequent decline which took place upon dissemination of the idea that a general strike may even yet be declared, the price fell back again to 30⅞, leaving it 4¾ higher on the week. Metropolitan Consolidated rose 2½, because obviously any arrangement that will afford substantial benefit to the District, must also be to the advantage of the older railway. Central London Deferred rose 2 points, and City and South London again put on ¼ in sympathy with the big jumps in the two other undergrounds.

Naturally, the dramatic rises in Districts and Metropolitans led to inquiries for Underground Electric issues, and the company's 6 per cent. Income Bonds rose 5 points, while the £10 shares at £2 are 7s. 6d. higher.

Also in sympathy with the movements just mentioned, London United Tramways Preference rose ⅛ to 3¼. Metropolitan Electric Trams 4½ per cent. Debenture stock at 101½ is ½ up. The principal feature, however, in this department is a rise of 12s. 6d. in British Electric Traction Preference, the modified scheme of the board which was put forward on Monday bringing in a good many buyers, on the assumption that the latest scheme will be permitted to pass without any particular opposition, and that it is a fairer arrangement than the scheme originally proposed. The Ordinary shares are also harder, and the Company's Second Debenture stock at 78 *ex* dividend is 3¼ higher on the week, allowing for deduction of the interest. We think there is no doubt that the differences between the various parties who have been wrangling over the British Electric Traction scheme will now be composed; and although it is early days yet to say how the company will progress under the new construction of capital account, it is reasonable to suppose that its chances are brighter. Still the question of capital reduction must be faced, it seems to us, sooner or later, and the sooner the better.

Electricity Supply issues at home are characterised by further strength in County of London Ordinary and Preference, which show rises of 7s. 6d. and 5s. respectively. The Ordinary have risen within the last few weeks from 7 to 8½, the reason being principally the recognition of the fact that the company's management is in the hands at once capable and enterprising. Moreover, the Ordinary shares have been showing a big yield on the money, and people are now turning their attention to City of London Ordinary, which this week have risen ¼. On the other hand, Charing Cross Ordinary lost a similar fraction, the price slipping back to 3⅞.

The Mexican group is decidedly strong, in regard to both the supply and tramway sections. Mexican Light and Power Common rose no less than 5½ points. An issue of 5 per cent. Second Debenture at 87 is being prepared for immediate offer. The Preference put on 2½, and Mexican Electric Lighting bonds rose 1½. In the other department, Mexico Trams are 3½ up and the 6 per cent. bonds show a gain of 1. Rio Trams put on 2 points to the accompaniment of rumours that the dividend will again be raised before very long. Sao Paulo Trams are 1 up. Electrical Development of Ontario bonds at 91 are 1½ higher. Toronto Power 4½ per cent. Debentures remain at 101, unaffected by the new issue that proved a success, the lists closing at 1 o'clock to-day, Tuesday. Shawinigan Water Capital stock is the only one in this section which has gone back. The demand for foreign railway, tramway, and industrials generally is brisk, and the activity in Home Railway stocks has not prejudiced the movement for buying foreigners. Incidentally, a little story may be mentioned of a client whose broker the other day advised him to buy London General Omnibus stock at 134. The client answered in a defiant wire: "British things no good, sell £500 'Bus." The instructions were, of course, carried out, and within a few hours the patriot found himself with a stiff loss. (There is no moral to be drawn from this.)

In the Telegraph market Marconis are still by far the most animated security, and the price rose to 2⅛ as a result of the meeting, but reacted to 50s. later on. Great Northern Telegraphs continue to mount steadily, and are 15s. higher on the idea that the company must be coining money out of the Chinese news. Direct United States Cable lost the 5s. which they picked up last week, but the Anglo-American group is practically unchanged. A little New York selling depressed American Telephone and Telegraph stock, the news that the United States Government is about to proceed against the Steel Corporation being a nasty shock to those with money invested in American companies that might be accused in the same sort of way. Amazon Telegraphs are harder, and nobody paid any heed to irresponsible reports of a rising of the natives in the company's territory. West Coast of America eased off a trifle, though the 4 per cent. Debentures put on ½. Telephone issues are quiet. National Deferred fell ½, some of the holders getting a little quaky as the company's existence draws so near its time for expiry. The First Preference are also a little easier, but the Preferred stock is ½ higher. Monte Video Telephone Ordinary and Preference recovered their dividend deductions, and other Telephone shares are steady.

In the Manufacturing division, Babcock & Wilcox rose ⅞, despite the Cabinet changes, which are supposed to herald an era of slowing down in naval construction. Edison & Swan fell a similar fraction, because of the disappointment which we noticed last week that the company should not have declared a dividend on the Ordinary shares. Telegraph Constructions rose 20s. in sympathy with the general firmness of Telegraphs as a whole.

The Anglo-Argentine Tramways new issue of 5 per cent. Debenture stock was well subscribed, and the price has been pretty firmly established at ½ to 1 premium for cash.

ELECTRIC TRAMWAY AND RAILWAY TRAFFIC RETURNS.

Locality.	Fortnight ended.	Receipts for the fortnight.		No. of wks.	Total to date.		Route miles open.	
		£	£*		£	£*		Inc.
Aberdeen	Oct. 26	2,699	+ 162	21	33,490	+ 1,918	..	..
Ayr	,, 29	388	— 7	24	9,300	+ 32	..	..
Bath	,, 28	1,763	+ 86	43	36,779	+ 1,072	8	..
Birkenhead	,, 29	2,146	+ 106	30	46,177	+ 1,827	13·7	..
Birmingham Corp.	,, 21	18,470	+4,491	29	242,256	+43,892	56·4	..
Blackburn	,, 25	2 231	+ 190	30½	36,574	+ 3,127	14·6	..
†Blackpool Corp. ..	,, 26	588	— 14	..	54,196	+ 7,058	..	..
Blackpool-Fleetw'd	,, 28	635	— 89	17	23,450	+ 1,928	..	..
Bolton	,, 22	4,867	+ 248	30	76,105	+ 5,073	26	..
Bournemouth ..	,, 25	3,196	+ 204	30	68,052	— 916	22	..
Bradford	,, 21	10,843	+ 722	29	164,780	+11,819	56	1
Brighton	,, 29	1,789	— 18	30	34,687	+ 2,024	9·5	..
Bristol	,, 27	12,258	+1,060	..	..	..	..	..
Brit. Elec. Trac. Co.								
Airdrie	,, 20	494	+ 35	42	9,274	+ 86	3·65	..
Barnsley	,, 20	388	+ 36	,,	7,102	+ 558	..	..
Barrow	,, 20	620	+ 140	,,	13,096	+ 1,722	5·37	..
Devonport	,, 20	1,026	+ 142	,,	21,102	+ 3,057	8·85	..
Gateshead	,, 20	2,136	+ 40	,,	43,906	+ 2,857	11·25	..
Gravesend	,, 20	420	+ 14	,,	9,079	+ 292	6·5	..
Greenock	,, 20	1,457	+ 321	,,	30,772	+ 4,235	7·25	..
Hartlepool	,, 20	514	+ 53	,,	11,648	+ 1,038	6·72	..
Kidderminster ..	,, 20	191	..	,,	5,061	+ 288	..	..
‡Leamington	,, 20	352	— 76	,,	7,672	+ 401	..	..
Merthyr	,, 20	425	+ 15	,,	8,864	+ 132	2·9	..
Metropolitan ..	,, 20	17,379	+1,687	,,	372,515	+55,708	22	..
Middleton	,, 20	643	+ 29	,,	14,594	+ 1,187	8·5	..
Mid.Joint Com'tee	,, 20	8,474	—3,567	,,	226,045	—17,653	..	..
Oldham—Ashton	,, 20	1,203	+ 89	,,	24,305	+ 933	9·13	..
Peterborough ..	,, 20	244	+ 20	,,	5,511	+ 536	5·31	..
Potteries	,, 20	4,245	+ 292	,,	81,835	+ 7,669	29	..
Rothesay	,, 20	118	— 6	,,	9,8 1	+ 62	2·75	..
Southport	,, 20	544	+ 25	,,	13,149	+ 510	8·17	..
S. Metropolitan ..	,, 20	1,615	..	,,	37,151	+ 1,917	..	..
Swansea	,, 20	2,254	+ 57	,,	48,449	+ 2,789	12·5	..
Tynemouth	,, 20	349	— 27	,,	11,688	+ 409	3·75	..
Weston-s-Mare ..	,, 20	126	+ 26	,,	7,257	+ 1,042	8	..
‡Worcester	,, 20	546	— 5	,,	12,674	+ 561	5·75	..
Wrexham	,, 20	214	+ 20	,,	4.316	+ 508	..	..
Yorks. Wool. Dist.	,, 20	2,173	+ 116	,,	44 569	+ 2,926	17	..
Miscellaneous ..	,, 20	419	+ 26	,,	9,624	+ 546	..	..
Burnley	,, 28	2,711	+ 212	..	..	..	11·7	..
Burton-on-Trent ..	,, 29	562	+ 45	30	9,020	+ 695	6·65	..
Bury	,, 29	2,425	+ 116	30	40,046	+ 3,411	22·5	..
Cardiff	,, 30	4,657	+ 164	26	66,470	+ 5,625	..	..
Chatham and Dist.	,, 26	1,604	— 123	43	37,120	— 57	15	..
Cork	,, 26	971	+ 6	43	21,772	+ 558	9·9	..
†Croydon	,, 20	1,698	+ 17	28	51,467	+ 3,963	11·7	..
†Darlington	,, 21	216	+ 2	30	6,638	+ 689	..	..
Darwen	,, 27	529	+ 29	30	8,945	+ 632	4·86	..
†Dover	,, 29	222	+ 10	29	8,258	+ 1,228	4·75	..
Dublin	,, 27	10,851	+ 379	..	110,999	+10,831	54·2	..
Dundee	,, 25	2,249	— 101	23	28,083	— 714	15	..
East Ham	,, 28	2,102	+ 3	30	33,605	+ 1,718	7·9	..
Exeter	,, 27	646	+ 19	30	11,024	+ 809	5·5	..
Glasgow	,, 28	40,220	+3,816	..	413,959	+28,426	98	..
Hastings	,, 30	1,776	+ 13	..	..	..	..	..
Huddersfield ..	,, 28	3,785	+ 185	30	60,426	+ 6,618	29·5	·5
Hull	,, 28	6.154	+ 651	30	87,895	+ 4,444	14·5	..
Ilkeston	,, 26	288	— 9	30	4,085	+ 80	..	..
Ipswich	,, 28	781	+ 23	30	14,615	+ 819	10·5	..
Kilmarnock	,, 21	3 8	+ 8	28	3,955	+ 386	4·25	..
Lancashire United	,, 25	2,621	+ 123	43	58,466	+ 1,889	29	..
†Leeds	,, 21	7.410	+ 486	29	223,856	+14,383	108	..
Leicester	,, 28	4,978	+ 318	..	..	..	..	..
Leith	,, 28	1,682	+ 61	23½	16,376	+ 1,147	8·7	..
Liverpool	,, 21	23,238	+ 889	42	481,800	+14,504	116	2·5
‡L.C.C.	,, 18	87,191	+1,697	..	1,582,915	+79,621	141·6	9
London United ..	,, 28	11,400	— 322	..	285.186	+ 9,266	..	..
Lowestoft	,, 28	359	+ 2	4	757	— 26	3·5	..
Manchester	,, 28	32,460	+1,409	30	494,846	+26,772	188	..
Newcastle	,, 28	9,027	+ 994	..	130,524	+ 9,876	14·5	..
Newport	,, 21	1,368	— 22	29	21.162	+ 668	14·5	..
Oldham	,, 29	3.838	+ 207	31	60,845	+ 2,615	29·76	·5
Pontypridd	,, 28	826	+ 9	30	12,673	— 33	5·5	..
Portsmouth	,, 21	3,914	+ 148	29	71,376	+ 6,098	15·25	..
Preston	,, 25	1,502	+ 3	30	24,062	+ 1,320	..	..
Rotherham	,, 26	1,365	+ 85	29?	20,668	+ 1,688	12	..
Salford	,, 28	9,686	+ 389	29	145,712	+ 6,547	..	..
Sheffield	,, 31	12,940	+ 748	31	200,312	+12,847	40	..
Southampton	,, 25	2.284	+ 228	30	38,748	+ 4,461	22	..
Southend-on-Sea ..	,, 25	1,046	+ 107	30	24,671	+ 3,515	..	..
South Shields ..	,, 28	1,161	+ 27	30	19,515	+ 2,048	..	..
Swindon	,, 25	323	+ 27	..	4.950	+ 550	..	..
Tyneside	,, 25	1,065	+ 199	17	9 221	+ 1,351	..	..
Wallasey	,, 28	1,984	+ 174	39	34,896	+ 5,106	..	..
Walthamstow ..	,, 28	1,324	— 24	30	23,965	+ 1,578	9	..
West Ham	,, 19	5,812	+ 269	29	80,181	+ 7,276	15·25	..
Wolverhampton ..	,, 25	1,924	+ 105	30	30 174	+ 1,880	25	..
Cen. London Rly..	,, 28	10,148	—1,281	17	77,270	—14,028	6·22	..
City & S. Lon. Rly.	,, 29	6.599	+ 149	17	52,774	— 58	7·26	..
Dublin-Lucan Rly.	,, 27	236	— 16	17	2,708	— 48	7	..
G.N. and City Rly.	,, 28	2.956	+ 54	17	23,600	+ 482	3·5	..
L'pool Overh'd Rly.	,, 29	2 848	+ 106	..	25,970	+ 1,970	6·8	4·2
Llandudno-Col. Bay	,, 27	315	— 1	17½	14,718	+ 556	..	..
London Elec. Ry. Co.	,, 28	57,920	+1,715	17	208,800	+ 5,805	21·25	..
Mersey Railway ..	,, 28	4 020	+ 19	17	34,014	— 1,498	4·5	..
Metropolitan Rly.	,, 29	88,920	— 227	17	277,774	— 5,882	24·5	..
Met. District Rly.	,, 28	28,400	+1,080	17	184,066	+ 8,125	24	..
Anglo-Argentine ..	,, 28	97,162	+3,128	..	2,097.198	+184,428	..	..
‡Auckland	Sept.	15.905	+1,810	3	48,372	+ 3,617	23·3	·6
Bombay (B.E.T.) ..	Sept. 29	5,989	+ 592	39	111,171	+ 6.798	..	..
‡Brisbane	August	24,550	+2,700	8	168,550	+18,725	..	..
Brit. Columbia Rly.	..	..	..	..	..	..	..	..
Calcutta	Oct. 28	8 451	+ 2,397	..	..	..	..	..
Cape Electric T.Ld.	..	..	..	..	..	..	..	..
‡Kalgoorlie, W.A...	Sept.	3,691	..	..	31,698	..	20·5	..
‡Lisbon	..	..	..	..	..	..	..	..
Madras	Oct. 15	1,489	+ 43	..	26,141	+ 2,340	..	..
‡Montevideo ..	Sept.	28,246	+1,886	11	278,519	+16,540	..	..
Perth (W.A.) ..	Oct. 27	3,415	+ 684	..	69,288	+15.672	29	..

* Compared with the corresponding period of 1910. † One week only.

‡ Includes horse, steam and other receipts. § One month.

SHARE LIST OF ELECTRICAL COMPANIES.

ENGLISH ELECTRICITY SUPPLY AND POWER COMPANIES.

NAME.	Stock or Share.	Dividends for		Closing Quotations Oct. 31st.	Rise + or Fall —	Present Yield p.c.
	*	1910.	1911.			£ s. d.
Bournemouth & Poole, Ord.	10	5½	5†	7⅞ — 8¼	..	6 5 9
Do. 4½ % Pref.	10	4½	4½	8¾ — 9¼	..	4 12 4
Do. Second 6 % Pref.	10	6	6	10¼ — 10½	..	5 11 7
Do. 4½ % Deb. Stock	Stock	4½	4½	101 —103	..	4 7 5
Brompton & Kensington, Ord.	5	10	9†	7⅝ — 8⅛	..	6 3 1
Do. 7 % Cum. Pref.	5	7	7	7⅞ — 7⅞	..	4 7 6
Central Electric Supply, 4 % Guar. Deb.	100	4	4	99 —102	..	3 18 5
Charing Cross, West End & City	5	5	5†	3½ — 4	— ⅛	6 5 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛ — 4⅜	..	4 12 4
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	3⅞ — 4¼	..	5 5 11
Do. Do. 4 % Deb.	100	4	4	94 — 98	..	4 1 8
Chelsea, Ord.	5	5	4†	3⅞ — 4⅛	..	5 14 3
Do. 4½ % Deb.	Stock	4½	4½	98 —100	..	4 10 0
City of London, Ord.	10	7	6†	12½ — 13⅝	+ ⅛	5 10 11
Do. 6 % Cum. Pref.	10	6	6	11½ — 12⅝	..	4 14 1
Do. 5 % Deb.	Stock	5	5	119 —123	..	4 1 4
Do. 4½ % Second Deb.	100	4½	4½	100 —103	..	4 7 5
County of Durham, 5 % First Mort. Deb.	Stock	5	5	89⅜ — 91½	..	5 9 3
County of London, Ord.	10	5	4†	8½ — 8⅝	+ ⅜	5 14 3
Do. 6 % Pref.	10	6	6	11 — 11½	+ ½	5 4 4
Do. 4½ % Deb.	Stock	4½	4½	108 —110	..	4 1 10
Do. 4½ % Second Deb.	Stock	4½	4½	99 —102 xd	..	4 8 3
Edmundson's, Ord.	5	Nil	Nil	⅜ — ⅝	..	Nil
Do. 6 % Cum. Pref.	5	Nil	Nil	2 — 2½	..	Nil
Do. 4½ % First Mort. Deb.	100	4½	4½	82 — 85	—1	5 5 11
Folkestone	5	6	6†	4½ — 5	..	6 0 0
Do. 5 % Cum. Pref.	5	5	5	4⅝ — 5⅛	..	4 17 7
Do. 4½ % First Deb.	100	4½	4½	95 — 98	..	4 11 10
Hove	5	9	8†	6¾ — 7¼	..	6 4 2
Kensington & Knightsbridge, Ord	5	9	8†	6⅞ — 7⅛	..	6 4 2
Do. 4 % Deb.	Stock	4	4	91 — 93	..	4 6 0
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	80 — 84	..	5 7 2
London Electric, Ord.	8	2	..	1⅝ — 2	..	3 0 0
Do. 6 % Pref.	5	6	6	4¼ — 4⅝	..	6 3 1
Do. 4 % First Mort. Deb.	Stock	4	4	89 — 92	..	4 7 6
Metropolitan	5	5	4†	3½ — 4	..	6 5 0
Do. 4½ % Cum. Pref.	5	4½	4½	4¼ — 4⅜	..	4 14 9
Do. 4½ % First Mort. Deb.	Stock	4½	4½	100 —105	— ½	4 5 9
Do. 3½ % Mort. Deb.	Stock	3½	3½	84½ — 87½	..	4 0 0
Midland Electric Corporation 4½ % First Mort. Deb.	100	4½	4½	96½ — 98½	..	4 11 5
Newcastle-on-Tyne	5	4	4†	3½ — 4	..	5 0 0
Do. 5 % Pref., Non. Cum.	5	5	5	4 — 4½	..	5 11 1
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	99 —102	..	4 18 0
Notting Hill	10	8	6†	..	..	..
Oxford	5	7½	6†	6½ — 6⅝	..	5 9 5
St. James' and Pall Mall, Ord.	5	10	10†	8 — 8½	..	5 17 8
Do. 7 % Pref.	5	7	7	6⅞ — 7¼	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	85 — 87	..	4 0 6
Smithfield Markets, Ord.	5	Nil	..	1⅜ — 1⅞	..	Nil
South London, Ord.	4	5	..	2⅝ — 3	..	6 13 4
Do. 5 % First Mort. Deb.	100	5	5	99 —102	..	4 18 0
South Metropolitan, 7 % Pref.	1	7	7	1⅜ — 1⅝	..	5 17 11
Do. 4½ % First Deb. Stock	100	4½	4½	95⅛ — 98	..	4 11 10
Urban, Ord.	5	5	..	¾ — 1	..	..
Do. 5 % Cum. Pref.	5	5	..	2 — 2½	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	86½ — 88½	..	5 1 8
Westminster, Ord.	5	10	10†	7⅝ — 7¾	..	6 7 0
Do. 4½ % Cum. Pref.	5	4½	4½	4⅝ — 5⅛	..	4 8 9

COLONIAL AND FOREIGN ELECTRICITY SUPPLY AND POWER.

Adelaide, 6 % Pref.	5	6	6	5½ — 5⅝	..	5 6 8
Calcutta, Ord.	5	8½	..	6⅝ — 7⅛	..	5 19 4
Do. 5 % Pref.	5	5	5	5 — 5⅛	..	4 10 11
Calgary Power, 1st Mort. Bds.	100	5	5	96½ — 98½	+ ½	5 1 6
Canadian Gen. El. Com.	$100	7	7†	107 —110	+1	6 7 3
Do. 7 % Pref.	$100	7	7	118 —122	..	5 14 9
Cordoba Lt., Power and T., Ord.	1	3	..	3⅜ — 3⅞	..	3 11 1
Do. 5 % Deb.	100	5	..	93 — 96	+1	5 4 2
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	94 — 96	..	6 5 0
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	84½ — 87½	..	5 14 3
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	90½ — 91½	+1	5 9 3
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	⅞ — 1	..	Nil
Do. 6 % Pref.	1	6	6	15/16 — 1 1/16	..	8 14 6
Kaministiquia Power, 5% G. Bs.	$500	5	5	102 —104	+ ½	4 16 2
Madras, Ord.	5	..	..	2⅜ — 3⅛	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	96 — 98	+1	5 2 0
Mexican El. Lt., 5 % 1st M. Bds.	..	5	5	88 — 90	+ 1½	5 11 1
Mexican Lt. & Power, Common	$100	4	4†	91½ — 93½	+5½	4 5 7
Do. 7 % Cum. Pref.	$100	7	7	107 —109	+2½	6 8 5
Do. 5 % 1st Mort. Gold Bds.	..	5	5	95 — 97	..	5 4 2
Monterey Rly. Light & Power, 5 % 1st Mort. Deb.	100	5	5	90 — 92	..	5 8 8
Montreal, Lt., H. and Power	$100	7	8	177 —182 xd	+ 1	3 16 11
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5	..	84 — 86	..	13 17 10
River Plate, Ord.	Stock	10	.	218 —223	..	4 7 9
Do. 6 % Non-Cum. Pref.	Do.	6	6	106 —112	..	5 7 2
Do. 5 % Deb. Stock	Do.	5	5	101⅛ — 103⅛	..	4 16 7
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	99 —101	..	4 9 1
Shawinigan Water, Capital	$100	4	5†	118 —120	—1	3 6 8
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	107 —109	..	4 11 9
Do. 4½ % Per. Deb.	Stock	4½	4½	103½ — 105½	..	4 5 4
Toronto Power, 4½ % Deb.	Do.	4½	4½	100 —102	..	4 8 3
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	92 — 94	..	5 6 5
Victoria Falls Power, Pref.	1	Nil	11¼d.	3/32 — 3/16	— 1/32	..
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	106½ — 108½	..	5 10 7

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	10	Nil	..	7⅞ — 8¼	+ 1/16	..
Do. 5 % Deb. Red.	Stock	5	5	99 —101	..	4 19 0
American Telep. & Teleg., Cap.	$100	8	8†	137 —139	—1	5 15 1
Do. Collat. Trust	$1000	4	4	93 — 95	..	4 4 3
Anglo-American Telegraph	Stock	3¾	3†	67 — 69	..	5 8 8
Do. 6 % Pref.	Do.	6	6	110¼ — 111¼	— ¼	5 7 10
Do. Def.	Do.	80/-	..	26 — 26⅝	..	5 13 2
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	101 —103	..	4 17 1
Chili Telephone	5	7	..	6⅞ — 7⅛	..	4 18 3
Commercial Cable, Stlg. 4% Deb.	Stock	4	4	86¾ — 88¼	..	4 10 5
Cuba Telegraph	10	6	6†	10 — 10⅛ xd	..	5 11 7
Do. 10 % Pref.	10	10	10	17 — 18 xd	..	5 11 1
Direct Spanish Telegraph, Ord.	5	4	4†	3¼ — 3⅜	..	5 6 8
Do. 10 % Cum. Pref.	5	10	10	8⅜ — 8⅝	..	5 14 3
Do. 4½ % Debs.	50	4½	4½	100 —102	..	4 8 3
Direct United States Cable	10	4½	..	7⅜ — 8¼	— ½	5 9 1
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	99½ — 101½	..	4 8 8
Eastern Telegraph, Ord. Stock	Stock	7	5†	136 —139	..	5 0 9
Do. 3½ % Pref. Stock	Do.	3½	3½	83 — 85	..	4 2 4
Do. 4 % Mort. Deb.	Do.	4	4	101 —103 xd	..	3 17 8
Eastern Extension	10	7	5†	13¼ — 13⅜	..	5 1 10
Do. 4 % Deb.	Stock	4	4	100½ — 102½	..	3 18 1
East and S. Africa Tel. 4 % Mt. Db. Mauritius Sub.	25	4	4	100 —102	..	3 18 5
Globe Telegraph and Trust	10	5⅝	6	10½ — 11	..	5 6 10
Do. 6 % Pref.	10	6	6	12⅞ — 13⅜	..	4 9 9
Great Northern Telegraph	10	18	5†	31½ — 32½	+ ½	5 9 11
Indo-European Telegraph	25	18	5†	56 — 58 xd	..	5 12 1
Mackay Companies Common	$100	5	5†	87 — 90	..	5 11 1
Do. 4 % Cum. Pref.	$100	4	4	73 — 76	..	5 5 3
Marconi's Wireless Telegraph	1	5	..	2 7/16 — 2 9/16	+ 1/16	..
Monte Video Telephone, Ord.	1	6	6	1⅜ — 1¼ xd	+ 1/32	5 12 11
Do. 5 % Pref.	1	5	5	1⅛ — 1⅛ xd	+ 0d.	5 6 8
National Telephone, Pref.	Stock	6	6†	103½ — 106½	..	5 13 9
Do. Def.	Do.	6	6†	117½ — 119½	— ½	5 6 6
Do. 6 % Cum. 1st Pref.	10	6	6	9⅜ — 10⅛	— ⅛	5 14 3
Do. 6 % Cum. 2nd Pref.	10	6	6	9⅜ — 10⅛	..	5 17 1
Do. 5 % Non-cum. 3rd Pref.	5	5	5	5 1/16 — 5 1/8	..	4 9 11
Do. 3½ % Deb.	Stock	3½	3½	99 —101	..	3 9 4
Do. 4 % Deb.	Do.	4	4	99 —101	..	3 19 8
New York Telep., 4½% Gen. Bnds.	100	4½	4½	103 —104	..	4 6 7
Oriental Telep. and Elec.	1	8	..	13⅛ — 13½	..	4 16 7
Do. 6 % Cum. Pref.	1	6	6	1⅛ — 1⅛	..	4 11 5
Do. 4 % Red. Deb.	Stock	4	4	88 — 90	..	4 8 11
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	99½ — 101½	..	3 18 10
Reuter's	8	5	5†	9 — 9½	..	4 4 3
Submarine Cables Trust	Cert.	6	6	130 —132	..	4 10 8
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	99 —101	..	4 9 1
United River Plate Telephone	5	8	8	7⅜ — 7 7/16	..	5 7 7
Do. 5 % Cum. Pref.	5	5	5	5 1/16 — 5⅛	..	4 10 11
West Coast of America	2½	2½	2½	1 5/16 — 1 7/16	— 1/16	4 15 3
Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4	4	98½ — 100½	+ ⅛	3 19 7
West India and Panama Teleg.	10	1½	..	2⅜ — 3	..	2 10 0
Do. 6 % Cum. 1st Pref.	10	6	6	10½ — 10⅝	..	5 12 11
Do. 6 % Cum. 2nd Pref.	10	6	6	9⅜ — 10⅛	..	5 17 1
Do. 5 % Debs.	100	5	5	101 —103	..	4 17 1
Western Telegraph, Ltd.	10	7	6†	13⅜ — 13⅝	..	5 0 11
Do. 4 % Deb.	Stock	4	4	101 —103	..	3 17 8
Western Union Tel., 4% Bnds. A	$1000	4	4	105½ — 108½	..	3 13 9
Do. 4½ % Fdg. Bonds	$1000	4½	4½	99 —102	..	4 8 3

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for 1910.	Dividends for 1911.	Closing Quotations Oct. 31st.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Bath Trams, Pref. Ord.	1	Nil	Nil	1/16 — 1/8	..	Nil
Do. 5 % Pref.	1	5	5	3/4 — 7/8	..	6 13 4
Do. 4½ % Deb.	100	4½	4½	80 — 85	..	5 5 11
Brit. Elec. Trac., Ord.	10	Nil	Nil	1/16 — 1/8	..	Nil
Do. 6 % Pref.	10	1½	1½	4 1/16 — 4 1/8	+ 1/32	3 3 2
Do. 5 % Deb.	100	5	5	98 — 96	+2	5 4 2
Do. 4½ % 2nd Deb.	100	4½	4½	76 — 80 xd	+3 1/4	5 12 6
Central London Railway, Ord.	100	3	3†	65 — 67	..	4 9 7
Do. Pref.	100	4	4	84 — 86	..	4 13 0
Do. Def.	100	2	..	50 — 52	+2	3 16 11
Do. 4 % Deb.	100	4	4	102 —104	..	3 16 11
City & South London, Ord.	100	1½	1½†	31 — 32	+ ½	4 13 9
Do. 5 % Pref., 1891	100	5	5	108 —110	..	4 11 0
Do. Do. 1896	100	5	5	104 —106	..	4 14 4
Do. Do. 1901	100	5	5	105 —105	..	4 15 3
Do. Do. 1903	100	5	5	102 —104	..	4 16 2
Do. 4 % Deb.	100	4	4	100 —102 xd	..	3 18 5
Dublin United Trams, 6 % Pref.	10	6	6	11 — 12	..	5 0 0
Great Northern & City, Pr'f. Ord	10	Nil	..	1/16 — 1/8	..	Nil
Hastings Trams, 6 % Pref.	5	Nil	3†	3/16 — 1/4	..	Nil
Do. 4½ % Deb.	100	4½	4½	74 — 79	..	5 13 11
Isle of Thanet Trams, 5 % Pref.	5	2½	..	2½ — 3	..	4 3 4
Do. 4 % Deb.	100	4	4	77 — 82	..	4 17 7
Lancashire United, 5 % Deb.	100	5	5	79 — 82	..	6 1 11
London Elec. Railw'ys, 4 % Deb.	100	4	4	96 — 98	..	4 1 8
London United Trams, 5 % Pref.	10	Nil	..	3 — 8½	+ ⅛	Nil
Do. 4 % Deb.	100	4	4	71 — 75	..	5 6 8

NAME.	Stock or Share.	Dividends for 1910.	Dividends for 1911.	Closing Quotations Oct. 31st.	Rise + or Fall —	Present Yield p.c.
	*					£ s. d.
Metropolitan Railway Consol.	100	1⅜	2†	43 1/16 — 44	+2½	3 2 6
Do. Surplus Lands	100	2½	3†	65 — 67	+1	4 2 1
Do. 3½ % Deb.	100	3½	3½	88 — 90	..	3 17 9
Do. 3½ % Pref.	100	3½	3½	85 — 87	..	4 0 6
Do. 3½ % Con. Pref.	100	3½	3½	84 — 86	..	4 1 5
Metropolitan District Ord.	100	Nil	..	30⅜ — 31	+5	Nil
Do. 6 % Deb.	100	6	6	144 —146	..	4 2 2
Do. 4 % Deb.	100	4	4	95 — 97	..	4 2 6
Do. 4 % Prior Lien	100	4	4	99 —101 xd	—1	3 19 3
Do. 4½ % First Pref.	100	3½	4½†	85 — 87	..	3 14 9
Do. 3½ % Gtd.	100	3½	3½	73 — 75	..	4 13 4
Metropolitan Elec. Trams, Ord.	1	5½	5†	3 3/16 — 3 3/8	..	5 12 4
Do. Def.	1	Nil	..	3 3/16 — 3 3/8	..	Nil
Do. 5 % Pref.	1	5	5	1/16 — 1	..	5 0 0
Do. 4½ % Deb.	100	4½	4½	100⅜—102½	+ ½	4 7 10
Do. 5 % Deb.	100	5	5	100 —102	..	4 18 0
Potteries, Ord.	1	2	..	1/16 — 1/8	..	..
Do. 5 % Pref.	1	5	5	3/4 — 7/8	..	7 12 4
Do. 4½ % Deb.	100	4½	4½	89 — 92	..	4 17 2
South Metro. Trams, 6 % Pref.	1	6	..	5/8 — 3/4	..	6 17 2
Do. 4 % Deb.	100	4	4	72 — 77	..	5 3 11
Underground Elec. Railways	10	..	..	1 7/16 — 2⅛	+ 3/16	..
Do. 4½ % Bonds	100	4½	4½	99 —101	..	4 9 1
Do. 6 % Income	100	1	1½†	64 — 66	+5	1 10 4
Do. Power House Debs.	100	4	4	100 —102	..	3 18 5
Yorkshire (West Riding), Ord.	5	Nil	..	1/4 — 3/8	..	Nil
Do. 6 % Pref.	5	Nil	..	2 1/16 — 2¼	..	Nil
Do. 4½ % Deb.	100	4½	4½	80 — 85	..	5 5 11

ELECTRICAL RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5	5½†	4 15/16 — 5 1/16	..	4 16 5
Do. 2nd Pref.	5	5	5½†	4 15/16 — 5 1/16	..	5 2 7
Do. 4 % Deb.	100	4	4	93¼ — 95½	..	4 8 9
Do. 4½ % Deb.	100	4½	4½	102 —104	..	4 6 7
Do. 5 % Deb.	100	5	5	100 —102	+½	4 18 0
Auckland Trams, 5 % Deb.	100	5	5	103 —106	..	4 14 4
Bombay Elec. S. & Trams, Pref.	10	6	6	10⅜ — 11¼	..	5 6 8
Do. 4½ % Deb.	100	4½	4½	97 — 99	..	4 10 11
Do. 5 % 2nd Deb.	100	5	5	98 —100	..	5 0 0
Brisbane Trams Invt., Ord.	5	8	8†	7 — 7 1/16 xd	+ 1/16	5 6 8
Do. 5 % Pref.	5	5	5	4 15/16 — 5 1/16 xd	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	102 —105	..	4 5 9
B. Columbia Elec. Rly., Def.	100	8	..	142 —146	+1	5 9 7
Do. Pref. Ord.	100	6	6	121 —125	..	4 16 0
Do. 5 % Pref.	100	5	5	108½ —111½	..	4 9 8
Do. 4½ % 1st Mort. Deb.	40	4½	4½	98 —101	..	4 9 1
Do. 4½ % Vancouver Deb.	100	4½	4½	101 —104	..	4 6 7
Do. 4½ % Con. Deb.	100	4½	4½	101½ —103	..	4 5 4
Calcutta Trams, Ord.	5	6	..	5 1/16 — 6 1/16	..	4 16 0
Do. 5 % Pref.	5	5	5	5 — 5 1/16	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	102 —105	..	4 5 9
Cape Electric Trams	1	Nil	..	1/16 — 1/8	..	Nil
City Buenos Aires Trams (1904)	5	5	2½†	5 1/16 — 5 1/8	..	4 5 1
Do. 4 % Deb.	100	5	5	97 —100	..	5 0 0
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	93 — 98 xd	..	5 2 0
Havana Elec. Rly., 5 % Bonds	$1000	5	5	101½ —104½	..	4 15 8
Kalgoorlie Elec. Trams	1	Nil	..	3/16 — 1/4	..	Nil
Do. 5 % A Deb.	100	5	5	92½ — 95½	..	5 4 9
Do. 6 % B Deb.	100	5	6†	62 — 66	..	7 11 6

La Plata Elec. Trms, Prf.	1	6	6	3/32 — 1/16	..	6 0 0
Lisbon Elec. Trams, Ord.	1	5½	6†	1 — 1 1/32 xd	+ 1/32	4 8 0
Do. 6 % Pref.	1	6	6	1 — 1 1/32	..	4 16 0
Do. 5 % Deb.	100	5	5	96 —100	..	5 0 0
Madras Elec. Tr. (1904), Deb.	100	5	5	95 — 98	..	5 2 0
Manaos Trams & Lt., 1st Deb.	100	5	5	90 — 92	..	5 8 8
Manila Elec. R. and Ltg., Bonds	$1000	5	5	98 —100	..	5 0 0
Mexico Trams Com.	$100	7	7†	121 —123	+3½	5 13 10
Do. Gen. Con. 5 % Bonds	..	5	5	98½—100½	..	4 19 6
Do. 6 % Bonds	100	6	6	100½—102½	+1	5 17 1
Para Elec. Rlys. & Lt., Ord.	5	10	10†	7 — 7⅛	..	6 15 7
Do. 6 % Pref.	5	6	6	5 1/16 — 5⅛	..	5 4 4
Do. 5 % 1st Deb.	100	5	5	99½—101½	..	4 18 6
Perth (W.A.) Elec. Tr., Ord.	1	2⅛	..	1 3/16 — 1 1/8	..	2 7 1
Do. 5 % 1st. Deb.	100	5	5	101½—103¾	..	4 16 7
Rangoon El. Tr. & Sup., Pref.	5	6	6	5 1/16 — 5⅛	— 1/16	5 9 1
Do. 4½ % 1st Deb.	100	4½	4½	98 —101	..	4 9 1
Rio de Janeiro Trams	$100	4½	5†	118½—119½	+2	3 15
Do. 1st Mort. 5 % Bonds	..	5	5	101½—102½	..	4 17
Do. 5 % Mort. Bonds	100	5	5	95½ — 96½	..	5 8 8
Sao Paulo Tram, Lt. and P.	$100	10	10†	181 —186	+1	5 7 6
Do. 5 % 1st Deb.	$500	5	5	104½—106½	..	4 13 11
Singapore Trams, 5 % Deb.	100	5	5	82 — 85	..	5 17 8
Southern El. Tr. B.A., 5 % Deb.	100	5	5	95½ — 97½	..	5 2 7
Un. Elec. Trams Monte Video	5	6	7	5⅝ — 6	..	5 0 0
Do. 6 % Pref.	5	6	6	5 — 5⅛	..	5 9 1
Do. 5 % 1st Deb.	100	5	5	99 —102 xd	— ½	4 18 0
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	106 —108	..	4 3 4

MANUFACTURING COMPANIES.

Aron, Ord.	1	Nil	6	3/16 — 1/4	..	Nil
Do. 6 % Pref.	1	9	6	7 15/16 — 8 1/16	..	7 7 8
Babcock & Wilcox	1	26	24†	5 15/16 — 6⅛	+ 1/16	4 8 6
Do. Pref.	1	6	6	1 15/16 — 2	..	4 0 0
B.I. & Helsby Cables	5	10	8†	6 15/16 — 7⅛	..	6 17 11
Do. Pref.	5	6	6	5 15/16 — 6⅛	..	4 16 0
Do. Deb.	100	4½	4½	102 —104	..	4 6 7
British Thomson-Houston, Deb.	100	4½	4½	94 — 97	..	4 12 9
British Westinghouse, Pref.	3	Nil	..	1/4 — 3/8	..	Nil
Do. Deb.	100	4	4	58 — 61	..	6 11 2
Do. 6 % Prior Lien	100	6	6	100 —102	+1	5 17 8
Browett, Lindley, Ord.	1	Nil	..	1/6—2/-	..	Nil
Do. Pref.	1	Nil	..	5/- —6/-	..	Nil
Brush, Ord.	2	Nil	..	1/16 — 1/8	..	Nil
Do. 7 % Pref.	2	Nil	..	1/4 — 3/8	..	Nil
Do. 4½ % Deb.	100	4½	4½	56 — 61	..	7 7 7
Do. 4½ % Second Deb.	100	4½	4½	39 — 44	..	10 4 6
Callender's Cable	5	15	10†	9 — 9 1/16 xd	..	7 13 10
Do. Pref.	5	5	5	4 13/16 — 5 1/16	..	4 16 5
Do. Deb.	100	4½	4½	101 —103	..	4 7 5
Castner-Kellner	1	17½	7½†	3 7/16 — 3 9/16	—1/16	4 18 3
Do. Deb.	100	4½	4½	104 —108	..	4 3 4
Crompton & Co.	3	Nil	Nil	1/4 — 3/8	..	Nil
Do. Deb.	100	5	5	55 — 65	..	7 13 10

Dick, Kerr	1	5	..	3/8 — 7/16	..	5 14 3
Do. Pref.	1	6	6	1 1/16 — 1 1/8	..	5 12 11
Do. Deb.	100	4½	4½	95 — 98	..	4 11 10
Edison & Swan, A, £3 paid	5	Nil	..	1/8 — 3/16	—1/16	Nil
Do. fully paid	5	Nil	..	1 1/4 — 2½	..	Nil
Do. 4 % Deb.	100	4	4	67 — 71	..	5 12 8
Do. 5 % Second Deb.	100	5	5	77 — 80	..	6 5 0
Electric Construction	2	Nil	2½†	1/4 — 3/8	..	6 13 4
Do. Pref.	2	7	7	1 13/16 — 1 15/16	..	7 4 4
Greenwood & Batley, Pref.	10	7	7	7½ — 8½	..	8 5 8
Do. Deb.	100	5	5	94 — 96	..	5 4 2
General Electric, Pref.	10	5	5	9 — 9½	..	5 5 3
Do. Deb.	100	4	4	86 — 91	..	4 7 11
Henley's, Ord.	5	15	10†	11⅞ — 12⅜	..	5 18 10
Do. Pref.	5	4½	4½	4 15/16 — 5 1/16	..	4 5 11
Do. Deb.	100	4½	4½	106¾—108¾	..	4 2 11
India-Rubber, G. & T.	10	10	..	13⅜ — 15⅜	..	6 9 0
Do. Pref.	10	5	5	9¾ — 10⅜	..	4 16 5
Telegraph Construction	12	20	10†	36 — 38	+1	6 3 10
Do. Deb.	100	4	4	100 —102	..	3 18 5
Willans & Robinson	1	Nil	..	3/32 — 3/16	..	Nil
Do. Pref.	5	Nil	..	1/4 — 3/8	..	Nil
Do. Deb.	100	4	4	55 — 65	..	6 3 1

* Unless otherwise stated, all shares are fully paid. † Interim dividend.

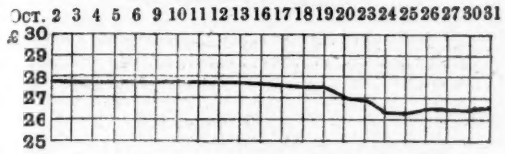
The yields are in all cases calculated upon the dividends paid for 1910.

Bank rate of Discount 4 per cent., September 21st, 1911.

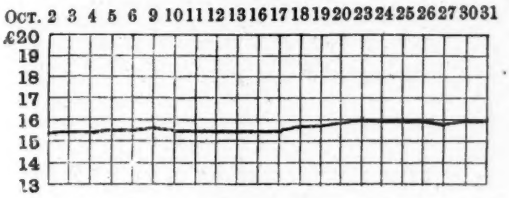
METAL MARKET.

Fluctuations in October.

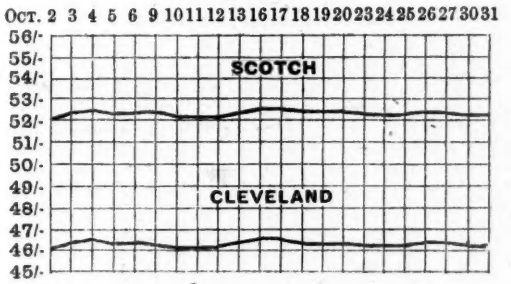
SPELTER (G.O.B's.).



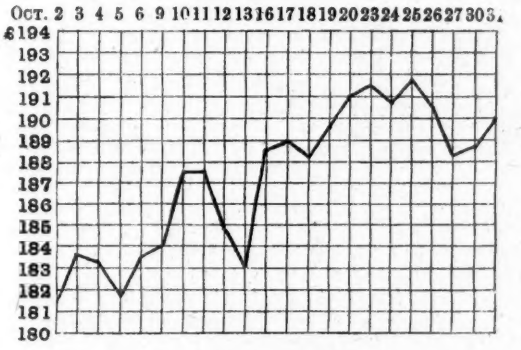
LEAD (ENGLISH).



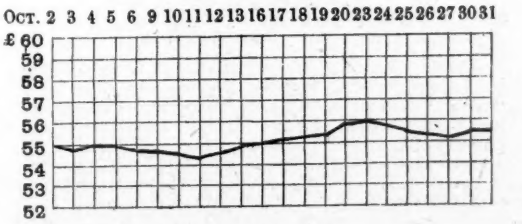
IRON.



TIN.



COPPER (G.M.B's.).



Warrington Electricity Supply.—The Electricity Committee considered a letter from the Lancashire County Bridgemaster with reference to the supply of electric current for the working of the proposed new Sankey Canal Bridge, and decided to reply that the Committee was not prepared to undertake the working of the bridge, but offered to provide cables and power for that purpose on payment by the County Council of the usual charges. When the matter came before the Warrington T.C., Alderman Smethurst said the County Council had never shown any favourable disposition towards Warrington, with regard to the building of the bridge, and he did not see why Warrington should come to its aid. The T.C. supported the Committee in this decision.

PROCEEDINGS OF INSTITUTIONS.

Corrections for the Effects of Atmospheric Conditions on Photometric Flame Standards.

By W. J. A. Butterfield, F.I.C., J. S. Haldane, M.D., F.R.S., and A. P. Trotter, M.Inst.C.E.

(*Abstract of a paper read at the Meeting of the International Photometric Commission at Zürich, July*, 1911.)

The effects of variation of the pressure, degree of humidity and vitiation (deficiency of oxygen and excess of carbon dioxide) of the atmosphere on the luminous intensity of flames cannot be determined from the variations naturally occurring in an ordinary photometric testing room, except, perhaps, by deduction from the data obtained in a very prolonged series of observations made with exceptional care concurrently with extremely accurate determinations of the composition of the air. The investigation may be carried out in a much shorter space of time and with greater trustworthiness if the observations are made in a room or chamber provided with means by which one set of conditions may be varied at will to any desired degree, almost or wholly independently of the other two sets of conditions. The authors have made the investigations, of which the results are reported in this communication, in such a room or chamber.

Use was made of a steel compression chamber, designed primarily for physiological research on "caisson disease" or diver's palsy and mountain sickness, which had been presented to the Lister Institute of Preventive Medicine by Dr. Ludwig Mond, F.R.S.

A small electric lamp was used as a standard.

An Osram lamp intended to give 10-candle power at 10 volts was tried, and was supplied by six accumulators controlled by an adjustable resistance. But a comparison with the pentane lamp showed that the colours of the lights differed too widely to make accurate photometry possible until the light of the electric lamp had been reduced to about one candle. It was hoped that a metallic-filament lamp thus used would have an enhanced "life," or, in other words, would vary less by ageing than if worked at 10 candles. But the result was disappointing.

In the second series of experiments, a large battery being available, a Fleming-Ediswan photometric lamp standard was used, giving 10 candles at 60·05 volts with 0·7577 ampere. This gave no difficulty.

The procedure followed in making the testings led ultimately to corrections being deduced, all of which were independent of the work or formulæ of other observers.

The experiments made to determine the corrections for variations of atmospheric pressure were all carried out in the steel compression chamber. The range of variation of pressure for the

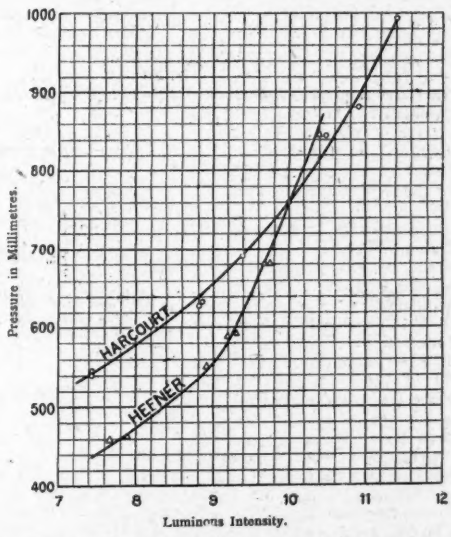


Fig. 1.—Effect of Variation of Pressure.

observations was from about 450 to 1,000 mm. (or from about 17¾ to 39½ in.). The results of the observations were ultimately corrected for the variations in the proportions of aqueous vapour and of carbon dioxide in the air, and the corrected figures thus obtained have been plotted, and give the curves shown in fig. 1. The curves show that the relation between atmospheric pressure and the yield of light is not constant or expressed by a straight line. The falling-off in the light with reduction of pressure is much greater at the lower than at the higher pressures.

The curve for the Harcourt lamp is, however, nearly a straight line for the range of 700 to 850 mm., and shows that within these limits the light increases or decreases by 1 per cent., with an increase or decrease respectively in pressure of 12·5 mm., or that a variation of 10 mm. in pressure is attended by a variation in the same sense of 0·8 per cent. in the light afforded by the lamp. These figures agree exactly with the correction deduced by C. C. Paterson, which may, therefore, be accepted as correct for

variations of pressure at about the neighbourhood of normal. In regard, however, to the effect of variations of pressure elsewhere, the authors have failed to find a rational equation to the pressure curve for the Harcourt lamp, and prefer to give the curve of the differential coefficient (shown in fig. 2) rather than an empirical formula. By the use of this curve, the correction which should be applied to the Harcourt lamp for barometric variations at any place at which the mean barometric height is considerably below 760 mm. may be deduced.

The curve for the Hefner lamp is likewise nearly a straight line for the range of 700 to 850 mm., and shows that within these limits the light increases or decreases by 1 per cent. with an increase or decrease respectively in pressure of 25 mm., or that a variation of

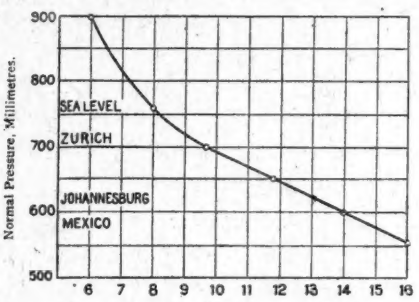


FIG. 2.—CURVE OF CORRECTION FACTOR.

10 mm. in pressure is attended by a variation in the same sense of 0·4 per cent. in the light afforded by the lamp. These figures differ from the correction deduced by Liebenthal from observations of the variation of the light of the Hefner lamp, caused by the natural fluctuations of the barometer between 735 and 775 mm., according to which a variation of 10 mm. in pressure is attended by a variation of only 0·1 per cent. in the light. Paterson mentions that he found for 10 mm. variation in pressure 0·2 per cent. variation in the light.

The authors ascertained the proportions both of aqueous vapour and of carbon dioxide in the air during the observations, and applied corrections to eliminate their effects, while the greater range of barometric change which they had at their disposal reduced the effect of unavoidable errors of observation on the final result. For these reasons, they believe that their figure of 0·4 per cent. should now be accepted in preference to Liebenthal's 0·1 per cent. for the effect on the light of the Hefner lamp of a change of 10 mm. in barometric pressure in the neighbourhood of 760 mm.

The experiments made to determine the effect of variations in the humidity of the air on the light afforded by flames were carried out partly in the steel chamber already described and partly in a small room at the Electrical Standards Laboratory of the Board of Trade.

Sets of observations on the Harcourt lamp showed that a change in the temperature *per se* of the air from 8° C. to over 20° C. had no definite effect on the light afforded. The results showed that the light of both the Harcourt and Hefner lamps decreases by 1 per cent. for an increase of 0·16 per cent. in the aqueous vapour in the air, or that an increase of 1 per cent. in the aqueous vapour in the air is attended by a decrease of 6·25 per cent. in the light of the lamps. Liebenthal found 5·5 per cent. for both lamps, while Paterson has found 6·6 per cent. for the Harcourt and 6·0 per cent. for the Hefner lamp, as the decrease in the light caused by 1 per cent. increase in the aqueous vapour in the air.

Experiments to determine the effect of different degrees of vitiation of the atmosphere on the light afforded by flames were made. Taking the proportion of carbon dioxide in the air as the sole measure of vitiation caused partially by breathing, but mainly by combustion of paraffin hydrocarbons or town gas, it was found that 1 per cent. decrease in the light of the Harcourt lamp was caused when approximately 0·035 per cent. of carbon dioxide was present in the air, and in the light of the Hefner lamp with 0·045 per cent. Or the presence of 0·01 per cent. of carbon dioxide in the air was attended by a reduction of 0·29 per cent. in the light of the Harcourt, or of 0·22 per cent. in the light of the Hefner lamp.

GENERAL FORMULÆ FOR CORRECTIONS.

The corrections found for the Harcourt and Hefner lamps may be applied thus:—

Let A = the accepted normal percentage of aqueous vapour in the air.

Let C = the accepted normal percentage of carbon dioxide in the air.

„ P = the accepted normal pressure of the air in millimetres.

„ a = the prevailing percentage of aqueous vapour in the air when the lamp is in use.

„ c = the prevailing percentage of carbon dioxide in the air when the lamp is in use.

„ p = the prevailing pressure of the air when the lamp is in use.

Then the actual light (I′) of the lamp at the time, expressed in terms of its light (I) in normal conditions will be found with sufficient accuracy for all practical purposes from the equations:—

For the Harcourt lamp:—

$$I' = \frac{100 - \left(\frac{a - A}{0{\cdot}16} + \frac{c - C}{0{\cdot}035} - \frac{p - P}{12{\cdot}5}\right)}{100} \text{ I.}$$

For the Hefner lamp:—

$$I' = \frac{100 - \left(\frac{a - A}{0{\cdot}16} + \frac{c - C}{0{\cdot}045} - \frac{p - P}{25{\cdot}0}\right)}{100} \text{ I.}$$

The Mechanical Installation and Upkeep of Permanent Way on Railways.

By T. J. GUERITTE, B.Sc., M.Soc.C.E. (France).

(*Abstract of paper presented to the* SOCIETY OF ENGINEERS (INC.), *September*, 1911.)

THANKS to the progressive policy of the Great Western Railway, a trial has lately been made of the system of mechanical permanent way construction which has been in use in France since 1903. The system was devised by M. Albert Collet, M.Soc.C.E., of Paris.

The method can be employed without the least interruption of traffic on railway lines already in use, another important advantage being that the ballast is so thoroughly compacted that trains can be run at full speed on the track immediately after the operation of packing, thus avoiding delay during the period of a week or more in which trains are required to slow down when passing over sections that have been repacked by hand labour. It is also worthy of note that the mechanical packing is far more lasting than that effected in the customary manner.

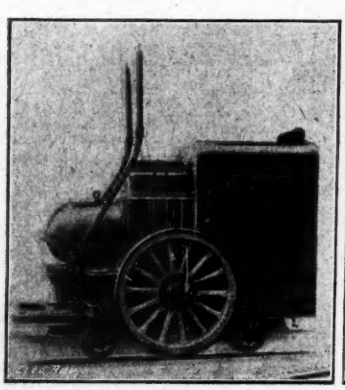
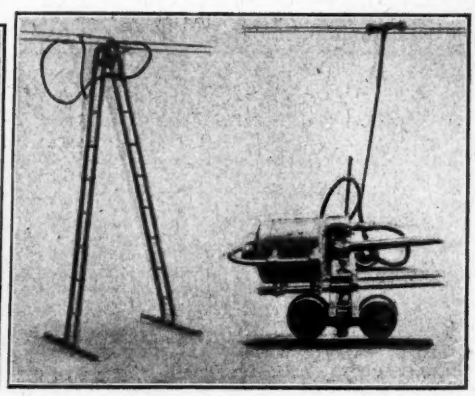


FIG. 1



FIGS. 2 AND 3.

The Collet plant includes a portable electrical generating set, a series of standards with power transmission cables, and a varying number of machines operated by electricity and supplied with current from the cables mentioned. The machines are placed in sequence, conformably with the successive operations required to be performed. They are drawn along the railway line as work proceeds, and as they consist of small units they can readily be lifted and removed from the tracks, to avoid interference with traffic.

The electricity generating set (fig. 1), which is mounted upon a carriage provided with shafts and wheels for traction by road and with small flanged wheels for travelling on rails, includes a petrol internal-combustion motor of from 23 to 45 H.P., according to the extent of the installation, direct-coupled to a dynamo of corresponding power, which gives continuous current at 240 volts. Two tanks are included, one for petrol and the other for water, the storage capacity being sufficient to ensure continuous working for the period of from 5 to 10 days without recharging. A water-cooling apparatus is fitted between the petrol motor and dynamo, and all working parts are hermetically closed by an airtight steel hood. Provision is made for transverse motion as an alternative to longitudinal movement along the railway lines. A lifting apparatus, akin to a screw jack, is fitted to the carriage, and by the aid of a crank one man can cause the entire plant to rest either upon the large wheels or upon the small flanged wheels, the latter being mounted so that they can be rotated on their axes through an angle of 90°.

One of the movable standards for carrying the power transmission cables is shown in fig. 2. Each standard carries 165 ft. of cable composed of two high-conductivity copper wires of 7/32 in. diameter, the tension of the transmission line being controlled by the rest seen at the top of fig. 2. Insulation loops are fitted as shown in the same view, and the current traverses the support through by-pass cables.

Any required number of standards are set up and connected by cable at distances of 165 ft. apart, in order to provide for operating

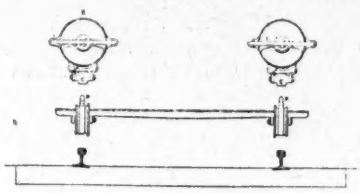


Fig. 4.

the mechanical plant, and it has been found that two trained men can install 4,100 ft. of transmission line in one day.

Each of the machines employed for boring sleepers, drilling rails, inserting bolts and screws and packing ballast is operated by an electric motor of 5 H.P., mounted on a small bogie and furnished with a trolley for the collection of current from the main transmission cable. By adopting a standard type of portable motor for the various machines, maintenance is simplified, and the number of spare parts to be kept in stock is reduced to a minimum.

Fig. 3 is a photographic view of a motor, in which the driving shaft is shown broken off. The trolley collects current from the transmission line, the cable takes current to the switch close to the

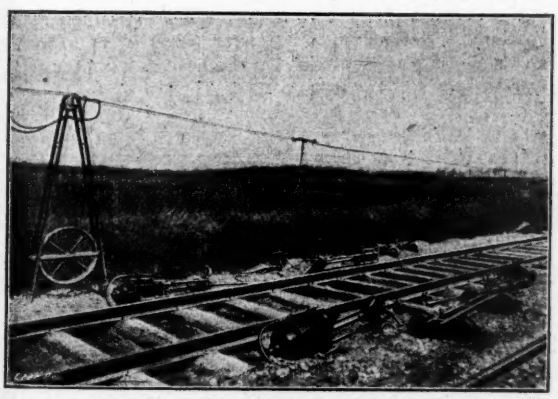


Fig. 5

motor, by which is driven the shaft connected at the other end with the machine to be driven. The underframe, on which the motor is mounted, has a step bearing receiving the supporting pivot of the bogie. The latter is formed of two articulated pairs of ball-bearing wheels connected by a cross frame enabling the two pairs of wheels to be spaced conformably with the gauge of the railway track. It will be noticed that as the various machines are employed in pairs, one for each line of rails, the complete bogie carries two motors, as represented in fig. 4.

Each motor is fitted with arms by which it can be readily lifted from the supporting pivot, while the bogie carriage can also

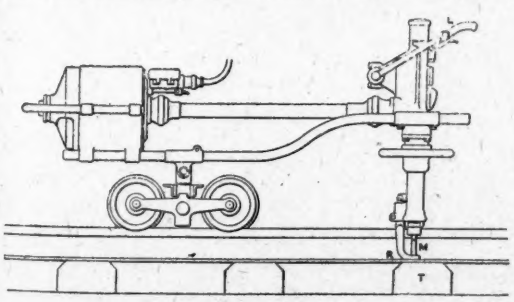


Fig. 6.

be lifted from the track without difficulty. This is a very important point, as it is absolutely necessary on railways already in service that the line shall not be obstructed. As each motor only weighs 3 cwt., and the bogie weighs 2 cwt., the work of taking all the machines out of the way can be performed quickly, and they can be just as easily put back and again set to work. It takes about one minute thus to clear the line.

Fig. 5 shows the track cleared for the passage of a train, the generating set and the power transmission line being already off the track but in close proximity thereto.

Fig. 6 is a view of the boring machine, connected with the portable electric motor by the horizontal driving shaft. The apparatus is designed for boring holes in sleepers when clamped either to the rail, as in fig. 6, or to a chair, and any inclination can be given to the boring spindle to suit requirements. The tool M penetrates the sleeper T to a depth governed by the stroke of the lever L; the spindle rotates at 1,500 R.P.M., and the hole is bored in two or three seconds in the hardest varieties of timber. The apparatus is capable of boring about 250 holes an hour. Fig. 7 represents the machine used for inserting and extracting screws and bolts. The frame C, carrying the motor and screwing machine, is balanced on the supporting pivot of the bogie carriage, and the universal joint K ensures the requisite mobility, enabling the head of the screw to be engaged even when presenting itself

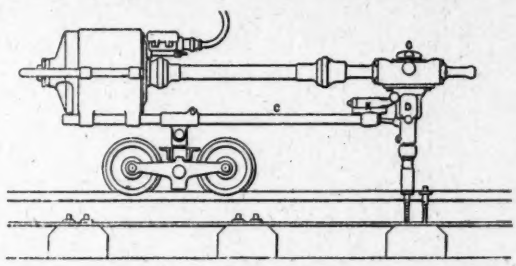


Fig. 7.

obliquely. The hand wheel G provides for reversing the direction of rotation so that the operations of screwing and unscrewing may be performed at will.

This tool develops considerable effort, so as to overcome the resistance of bent or rusty screws, and in order to prevent injury to the fibres of the timber an automatic release D stops the work as soon as any screw is driven home. The machine is operated at 550 R.P.M., and by its aid 500 screws can be inserted or extracted per hour. The weight of the head is 1 cwt., and of the complete apparatus, including motor and bogie carriage, 4 cwt. 3 qrs.

Fig. 8 shows a most useful machine employed for drilling holes through the web of double-headed rails. In this case only one machine is used on the track instead of one machine on each rail as before described. The machine is supported on the pivot P of the bogie carriage, and can be swung round for operation on either rail. It is clamped by the device shown at H, the drill F being fed by the hand wheel V. The twist drill runs at 200 R.P.M., and is capable of making 40 holes per hour, or about 10 times the number that can be drilled by a workman with a hand ratchet drill. The machine weighs 1 cwt. 21 lb., or 5 cwt. 14 lb. complete with motor and bogie carriage.

The machine for packing ballast is the most important of the various machines included in the plant. It consists essentially of a small ram actuated by the alternate compression and release of a powerful spring; the shaft rotates at 400 R.P.M., compressing a spring equivalent to a weight of 440 lb., enclosed in the head, the ram making 400 blows per minute. The machines are usually employed in two sets of four on either side of the sleepers, the in-

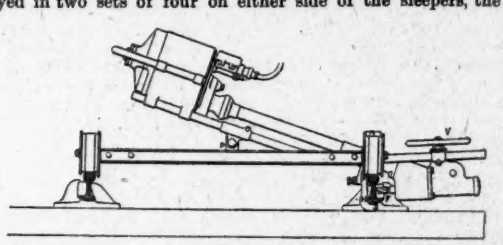


Fig. 8.

clination of the ram being such that the ballast can be compacted beneath the sleepers to form a sound and lasting foundation. Experience shows that absolute uniformity of the filling is secured throughout the whole length of the sleeper, and that the solidarity of the rammed material is so remarkable that trains can be allowed to travel at full speed on the track immediately after the completion of ballasting.

The output of two sets of four machines averages from 60 to 100 sleepers per hour, according to the thickness and nature of the stratum of ballast.

Adzing machines are made which can deal with from 1,000 to 2,000 sleepers per day of 10 hours. The cut is made by a high-speed milling cutter, which avoids marking and injury to the wood caused by the tools used in adzing machines of the usual fixed type.

An adzing machine also has been designed for re-adzing sleepers in cases where nothing would be gained by removing them from the track.

The process of re-adzing occupies only from 5 to 10 seconds, while a man with hand tools usually takes from 5 to 10 minutes to do the work imperfectly.

Other very useful appliances have been used with much advantage in conjunction with the permanent-way machines previously

described, and mention may be made of the workshop van, which is intended to accompany as closely as possible the mechanical railway plant, providing accommodation for the storage of spare parts and for workmen engaged in repairs.

The method has definitely passed the experimental stage, as shown by the fact that although it was only first applied in a tentative way as recently as the year 1903, the total length of railway track which has been laid and relaid by means of the mechanical plant described now amounts to more than 1,300 miles.

Institution of Post Office Electrical Engineers.

On the 16th ult., Major W. A. J. O'Meara delivered an address at the opening meeting of the session of the Metropolitan Centre. After referring to the impending transfer of the National Telephone Co.'s business to Post Office control, and the possibility, therefore, of a substantial increase in the membership of this Institution, he dealt with the education or training of engineers and the value of degrees, quoting Sir William Ramsay's remark before the British Association: "In England, we have made technical education a local, not an Imperial, question. Instead of half-a-dozen first-rate institutions of University rank, we have a hundred . . . . and the training given is not that for captains of industry, but for workmen and foremen."

He said that the fallacious idea prevailed far too widely in this country that the functions of an engineer corresponded to those of a foreman, and it was in the interests of, and should be the aim of, engineers to remove this wrong and sometimes mischievous impression. There were, it was true, "quack" engineers in this world, as there were "quack" doctors, but with this distinction, that while the medical profession had secured legal protection against "quackery," such protection had not, unfortunately, been secured by the engineering profession. A great amount of injury had been done, and was still being done, by "quack" engineers, and he considered that some system of registration should obtain; before a young man was admitted to practice as an engineer he should be required to submit some suitable proof of his qualifications for the profession. This raised the question of the value to be placed upon the possession of scientific degrees, a subject upon which there was a marked division of opinion. It seemed to him that what the commercial world was looking for was something in the nature of a hall-mark indicating the quality of the probable practical efficiency of the embryo engineer. The employer really desired that the student turned out from our educational establishments should bear some mark which would indicate not only the amount of his theoretical and practical knowledge, but also his real power to apply this knowledge to the work which the young engineer might be called upon to undertake, rather than a degree indicating examination-room performances. The requirements for the degrees conferred under the present system were largely based on considerations more limited than those in the contemplation of the manufacturer or other employer, and it was not surprising, therefore, that so much disappointment was felt in commercial circles with the degrees which were being so liberally bestowed, and which, necessarily, were almost wholly granted in respect of academic attainments of a certain order. The solution of the difficulty could be effected if for the present requirements for a degree there could be substituted some means for marking down a man's qualifications in such a way as to include not only his theoretical knowledge, but also his ability to apply it readily and effectively in a mundane organisation, in which it must be recognised that human beings, and not the materials used, constituted the factor of prime importance. In condemning the system under which degrees were granted, it was necessary to guard against the danger of a wholesale condemnation not only of the system itself, but also of all those on whom these degrees were conferred. Until the present system was modified, it seemed to him that the degree must be accepted as an indication mainly of certain scholastic attainments, and that the employer must himself be content to undertake the task of assessing the value of the personal and practical qualities of each aspirant engineer. Everyone who had any knowledge of the practical side of engineering fully recognised that owing to the advances which had been made in recent times, and to the large sums of money involved in engineering schemes, it was more and more necessary that the proper class of young men should be drawn into the profession; he was persuaded that no surer way to do this existed than that of properly appreciating the status and the value of the work of engineers. Sir James Inglis, doubtless, had this matter in mind when, some three years ago, in his Presidential Address before the Institution of Civil Engineers, he pointed out how important it was that the engineering work in Government Departments should be entrusted only to highly trained engineers. It was to be hoped that at no distant date his views on this subject would be very widely shared by all those in the highest authority.

If a full recognition of the status of engineers was to be secured, not only must each individual engineer display adequate professional and general knowledge, but the whole body of engineers must also actively co-operate to obtain the creation of a governing body to effect an efficient control over their profession, and thus to protect adequately their own interests and those of the public generally.

Wilton Works Electrified.—The factory of the Royal Carpet Co. has been fitted with an electrical installation by the British Westinghouse Co

THE ELECTRICAL CONGRESS AT TURIN.

(*Continued from page* 723.)

Section VII. (Accumulators, Electrometallurgy, &c.).—On September 13th Sig. Remo Catani opened proceedings with his paper on "The Direct Production of Steel from Ores by means of the Electric Furnace." The author first points out the advantages of the electric furnace over more complex methods, and describes the Stassano, Harmet, Chaplet-Néo, Lash, and Roechling-Rodenhauser methods, giving figures showing comparative yields. The conclusions come to are not, however, very definitely in favour of the electric furnace,

On the same day Dr. Guggenheim read his paper on "The Relative Yields of the principal Induction Furnaces employed in Steel-making." The furnaces taken are the Kjellin, and the Roechling-Rodenhauser. It was a scientific paper.

The proceedings on September 15th were opened by the reading of Dr. Erlwein's paper on "Electrical Methods of Purifying Water." The author notes the Webster and Hermite methods of direct hydrolysis, and Kellner's hypochlorite system, also that of Siemens and Halske. He then describes ozonising systems and the use of ultra-violet rays, and compares the two systems from the points of view of economy and effectiveness. This paper was very well illustrated. While it seems hardly to do justice to the importance of purification by hypochlorites of sodium and magnesium, or to touch upon the later forms of apparatus, it is valuable as giving particulars of the methods of using Cooper-Hewitt lamps for the purpose.

Sig. Luigi de Andreis followed with his paper, "The Sterilisation of Water for the Aqueduct of Rovigo." This is a description of a De Frise ozonising plant laid down for the town of Rovigo, which considered it necessary to sterilise the water derived from the Adige and the Po in flood times. In this installation a Diesel engine (35 H.P.) is employed. The voltage of the current used for the discharge is 7,000 volts at 900 periods per second.

Herr von Recklinghausen followed with his paper on "Sterilisation of Water Supplies by Ultra-Violet Rays." The author shows how, in company with Messrs. Henri and Helbronner, he studied the effects of these rays on bacteria, and announces the installation of sterilisation works on this system at Isle-sur-Sorgne. Saint Malo and Amiens have also decided to adopt it for their water supply. In the discussion, Sig. de Andreis inquired if the destruction of the bacteria was traceable to the action of ozone. Messrs. Erlwein and Recklinghausen replied that no trace of ozone could be detected in the water leaving the sterilisers.

The reading of the Accumulator papers is not recorded in the *Bulletins* of the Sessions. Dr. Beckmann's paper was on "The Position of Stationary and Portable Accumulators in the Electrical Industry." This is a comprehensive *résumé* of the various uses to which accumulators are put on lighting and traction systems, as well as on automobiles, and for train lighting.

M. J. A. Montpellier's paper on "Alkaline Iron-Nickel Accumulators" describes the Edison and Gouin types. He estimates the iron-nickel accumulator as capable of giving 8 to 20 watt-hours per kilogramme of weight, as against the lead accumulator's five or six.

Section VIII. (Taxation, Legislation and Charges).—The first paper taken in this section was that of Mr. E. C. Ericsson on "Legislation on the Transmission of Electric Energy." In this paper the leading features of the laws on the subject in all countries are touched upon, forming a very useful work of reference. The author concludes that too little legislation is better than too much.

Mr. Barnet Lyon followed with a paper identical in title, and containing a similar *résumé*. The author favours the system of a central advisory Committee, something on the lines of those under French and Swiss Law.

Dr. Schreiber's paper, "Legal Enactments on the Generation and Distribution of Electricity in Austria," was read in abstract by the secretary. From this paper it would

appear that Austria suffers (if that be the correct term) from too little legislation on the subject. Dr. Schreiber's paper is a timely effort in the direction of seeing that the code does not start out, in the usual manner, on a career of infinite complication.

On September 13th M. Sartori contributed his paper on "The Load Factor." This paper runs briefly through the numerous uses for electrical energy and goes also into the question of charging. At Lausanne, it appears, a tariff is in force which sells at a varying rate according to the time of day and the time of year. A double meter is in use, which is very little more complicated than an ordinary meter for two tariffs. This is not described, but given a reliable instrument of this kind, this certainly seems an excellent method of flattening the peak.

M. Mario Boughi then gave his paper on "A Comparative Study of Direct and Indirect Taxation on Electricity in Various Countries." This paper points out that direct taxation prevails only in Spain, Italy and Germany. Of these, the Italian tax is the heaviest. M. Boughi proposes, as a basis for the new law in process of discussion, that the price charged, and not the kilowatts or candle-power, be a basis of taxation, thus encouraging hydro-electric enterprises.

On September 15th, Sig. Ponti read his paper on "Rational Methods for the Commercial Measurement of Electricity." This paper advocates keeping the load-factor principally in view in framing tariffs. The paper was very well received.

Dr. Arno's paper (alluded to by Sig. Ponti), entitled "A Solution of the Problem of Buying and Selling Electrical Energy," concluded the proceedings in this section. The paper alludes to the system of double measurement which takes into account the power factor, and charges for energy at a varying tariff accordingly. This system does not, however, appear to take into account the mistrust of the consumer towards a system of which he can understand very little, or the possibilities of increased expense in the testing of such a meter. The meter above advocated, changing the tariff for different times of the day, is much more comprehensible to the user.

(To be continued.)

THE STANDARDISATION OF MOULDED COMPOSITIONS USED IN THE MANUFACTURE OF ELECTRICAL MACHINERY AND APPARATUS.

By HAROLD D. SYMONS, A.M.I.E.E.

Moulded compositions now play quite an important part in the insulation of electrical apparatus. There are, however, so many different materials on the market that where anything like a large use of them is made it becomes desirable to standardise them into various classes.

The manufacturers of such materials, for commercial reasons, designate them by trade names, prefixing by letters or numbers the grade or quality having certain properties. The number of products that may be classed under the term "moulded compositions" is now large, and the selection of one suitable for any particular purpose is more frequently determined by the physical and mechanical conditions it must fulfil than by its electrical properties. Whilst slight differences in physical and mechanical properties exist with different compositions, the methods of manufacture and ingredients may be so varied that it is quite possible for different manufacturers to produce materials to meet any given conditions without infringing patent rights. The selection of a material for any given purpose therefore requires discrimination and careful judgment, for though suppliers are generally prepared to give results of tests, the trade name is no guide in determining the characteristics of a material, and it becomes essential to judge the merits of compositions for individual cases.

This may, of course, be largely reduced by submitting to manufacturers the qualities desired, but these are frequently difficult to define, and samples are submitted in shape and form quite unsuitable for test. Where anything like an extensive use of moulded compositions for widely different purposes is made, this entails considerable work, and the author ventures to put forward a classification which has produced not only a great saving in time, but the elimination of failures due to the use of unsuitable materials.

Whilst moulded compositions may be sub-divided broadly into two classes, viz., those used for insulating purposes, and those used as arc-proof materials, numerous occasions arise where the material must not only be a good insulator, but withstand the action of an arc in a moist situation without deterioration. These conditions are very severe, but frequently occur in practice; this general classification, therefore, is not sufficiently discriminating to be adopted for standardisation purposes, and further sub-division must be made adequately to meet all conditions. It affords, however, a "broad" outline, and modifications in the physical properties required, in the class used for insulating purposes, afford the other satisfactory sub-division.

The standardisation is based entirely on the properties required, and is quite independent of the ingredients or process of manufacture.

The definition of mechanical properties is difficult, for they can, as a rule, only be specified in general terms; in the classification, however, conditions that the finished pieces must fulfil have been included, which will indicate the strength of the material.

Class 1.—This class will not be adopted for directly insulating voltages higher than 500, but must have a dielectric strength of not less than 5,000 volts for a thickness of $\frac{1}{10}$ in. The material need not be arc-proof, but should not be easily damaged by an arc or readily burn. It must be impervious to moisture, unaffected by cold mineral oil, and not soften below 70° C. The material must be sufficiently tough and hard so that no moulded piece shall be in any way damaged by falling from any position, by its own weight, through a distance of 4 ft., on to a stone or brick floor. Moulded pieces containing metal parts should withstand a fall of 2 ft., without the metal portion becoming loose or seriously cracking the material.

Class 2.—This material will be used for insulating voltages up to and including 3,000, and must have a dielectric strength of not less than 20,000 volts for a thickness of $\frac{1}{4}$ in. The material must not be greatly damaged by an arc and must not support combustion. It shall be unaffected by water, dilute acid and alkali, and impervious to mineral oil at 50° C. The softening temperature shall not be less than 100° C., and the material shall be so hard and tough that no moulded piece shall be in any way damaged by falling from any position by its own weight through a distance of 6 ft. on to a stone or brick floor. Moulded pieces containing metal parts shall withstand a fall of $2\frac{1}{2}$ ft. without the metal portions becoming loose or seriously cracking the composition.

Class 3.—This material will be used for insulating voltages up to 3,000, and must have a dielectric strength of not less than 20,000 volts for a thickness of $\frac{1}{4}$ in. The material need not be arc-proof, but must not be greatly damaged by an arc and not support combustion. It shall be entirely unaffected by seven days' immersion in water, dilute acid and alkali, and be impervious to mineral oil at a temperature 10° C. below the temperature at which it commences to soften. It shall be quite unaffected by temperatures lower than 130° C., and not soften below 150° C. The material shall be so hard and tough that no moulded piece shall be in any way damaged by falling from any position by its own weight through a distance of 10 ft. on to a stone or brick floor. Moulded pieces containing metal parts should withstand a fall of 4 ft. under similar conditions without the metal portion becoming loose or seriously cracking the composition. Besides withstanding these tests, the material shall be sufficiently tough and hard to allow a machine-cut thread to be made without difficulty and to take a high friction polish.

Class 4.—This material will not be used for directly insulating voltages higher than 1,000, but must have a dielectric strength not less than 5,000 volts for a thickness of $\frac{1}{10}$th in. It shall withstand the action of an arc without softening and not support combustion. It shall be moisture-proof and, preferably, impervious to mineral oils. It must be unaffected by temperatures lower than 100° C., and shall be sufficiently tough and hard to be sawn, drilled or turned, though it need not be so tough as to take a machine-cut thread.

Class 5.—This material may be used for directly insulating voltages up to 3,000, and shall have a dielectric strength of not less than 20,000 volts for a thickness of $\frac{1}{4}$ in. It shall not soften at less than 100° C., must be entirely waterproof, and, preferably, unaffected by dilute acids and alkalis. It must be capable of taking a high friction polish, which should be permanent, and, preferably, unaffected by oil. The material shall be sufficiently hard and tough for any moulded piece to fall by its own weight from any position through a distance of 6 ft. on to a stone or brick floor, whether containing metal portions or not, without fracture or undue damage. It need not be arc-proof, or non-inflammable, though it should not support combustion.

Class 6.—This material will not be used primarily for insulating purposes; it must be absolutely non-inflammable, and withstand the action of an arc without softening or crumbling. It need not be impervious to moisture, acids or alkalis, but it is desirable that

the material should not readily absorb oil. The material must be sufficiently hard and tough for any piece to fall by its own weight from any position through a distance of 2½ ft. on to a stone or brick floor without cracking or undue damage. It must be capable of being sawn and drilled without cracking; the colour is immaterial.

The foregoing classification will meet nearly all conditions arising in practice, and any exceptional conditions that must be met will naturally be outside any general standardisation.

The following indicates the types of pieces the different classes are suitable for :—

Class 1.—In general, this material will only be suitable for small pieces, and will not be adopted for pieces containing any large metal parts. Such pieces as bushes and insulating caps not exceeding 2 in. diameter, small handles, small terminal blocks, knobs, plugs and push buttons will be included in this class.

Class 2.—This material is suitable for large bushes, terminal blocks and pieces that are called upon to withstand rather rough handling, or required to insulate rather a high voltage.

Class 3.—This material is suitable for washers, spools, large bushes and any piece that must withstand compression. The composition that will meet this specification will be mechanically almost equal to vulcanised fibre and have higher insulating properties.

Class 4.—This material is suitable for small switch and circuit-breaker bases, insulating partitions between circuit-breakers on switchboards, and almost any purpose requiring material in sheet form. In general, the properties of materials in this class render them suitable only for flat pieces.

Class 5.—This material is suitable for switch handles, terminal plugs, for use on switchboards and pieces that must withstand much handling in service.

Class 6.—This material is suitable for arc shields and division plates.

The different materials can be tested and allocated to one or more of the classes for convenience in purchasing. It will be seen that materials that will meet the conditions of Class 2 would be suitable for Class 1, but the grading has been established with due regard to the question of cost, and a material to meet the conditions required by Class 2 will be higher in price than a material satisfactory for Class 1. The range of materials suitable for Class 1 is greater, and the pieces that it is possible to use it for have not to withstand the conditions Class 2 is designed to meet. In designing pieces it is well to consult suppliers' lists of standard products, for in some cases a slight modification in design will enable a manufacturer's standard piece to be adopted, and the expense of a mould saved.

The desired finish, whether dull or polished, and the colour should always be definitely specified.

With regard to the testing of moulded composition pieces there is need of considerable standardisation, for the results obtained are affected considerably by the method of test. The suggested standardisation also renders it necessary to modify slightly the tests for each class, but some tests may be universally adopted for all classes. So far as the dielectric strength is concerned, it should be clearly understood that the value specified shall be the minimum obtained, and the test may be made either on a sheet of the material or on a moulded piece with the electrodes placed in any position most convenient for obtaining a breakdown.

The dielectric strength test shall be made on the material as received, except in special cases as hereafter dealt with, and not after immersion in water or any other fluid. Only in cases of necessity, where the surface leakage is so considerable as to prevent a breakdown value being obtained, shall the dielectric strength test be made with the sample immersed in oil. Should the dielectric strength be very close to the minimum specified, the surface should be thoroughly freed from any varnish treatment and the test repeated. It is essential that the material itself shall not be dependent on any surface treatment for the insulating properties required. Insulation resistance measurements, except in rare instances, are not of great value. When such a test is made it should be carried out with the same precautions as have been suggested for testing the dielectric strength. Insulation resistance measurements are sometimes of value in indicating the amount of absorption of water or moisture, but the difficulty of obtaining samples of different materials in such a form as to enable comparative tests to be made led the author to abandon this test as a general one.

Testing the capability of a material to withstand the action of an arc is a test the result of which it is very difficult to define satisfactorily. Whatever conditions are adopted, identically the same method in every detail should always be used. A convenient method for conducting this test, adopted by the author, is to set two ⅛-in. diameter copper rods horizontally at such a distance apart that the air gap will break down at about 10,000 volts; the sample is then placed with a distance of ½ in. between its surface and the top of the rods; the voltage is raised till an arc is struck between the ends of the rods, and this is maintained for 30 seconds; the apparatus used must be the same for every test, and be so arranged as to protect the arc from draughts. A material suitable for Class 6 should withstand this test without softening, crumbling or cracking. The extent to which the other classes will withstand the action of an arc can only be judged by comparison.

Absorption tests, by immersion in water, acid, &c., are, of course, affected considerably by the size and shape of the piece and the length of time of immersion. The following outlines a standard method of test that is practicable, and gives accurate and comparative results :—

The sample should weigh approximately 25 grammes, and the dimensions of the piece should be such that the maximum length (or maximum outside measurement) shall not be greater than one and a-half times the minimum breadth (or minimum outside dimension). Any surface treatment should be removed before test. To judge whether a material is moisture-proof, immersion for 24 hours is sufficient, but where it is essential that the composition should be absolutely impervious to water, immersion should be continued for not less than three days, and may be maintained for 10. Superfluous water should, of course, be removed, and the sample should be weighed immediately on removal from the water.

Material suitable for Classes 2, 4 and 5 should absorb less than half of 1 per cent. during 24 hours' immersion, Class 1 less than 1 per cent., and Class 6 preferably less than 12 per cent., but may absorb 25 per cent. during 24 hours. Class 3 should in seven days absorb less than ·2 of 1 per cent.

The effect of acids and alkalis can be judged by immersion in dilute solutions. Whilst different materials are affected differently by different acids, it is desirable to standardise solutions, and immersion in N/10 solutions of sulphuric acid and sodium hydrate for 24 hours will render all tests comparable, provided the same precautions with regard to the shape and size of the sample outlined for the water absorption test be adopted.

All these absorption tests should be made at temperatures between 15° and 20° C. The effect of oil on a material can be judged by immersion in the same way, except that immersion in cold oil should be for not less than seven days, at the end of which time there should be no discoloration or softening of the material. A sample that must withstand hot oil should withstand immersion for six hours at 10° C. lower than the temperature at which it commences to soften, without any tendency to become soft or spongy. The size, shape and weight of the piece should be the same as for the other absorption tests, though it is often so difficult to remove the last trace of oil from the surface that no accurate increase in weight can be taken.

The softening temperature is one that is very difficult to determine accurately, and it is essential that a standard method of test be adopted and always employed. A convenient method is to suspend a ¾-in. cube in which a hole has been drilled, and a thermometer bulb inserted, in a small heater, and raise the temperature at the rate of 10° C. per hour. Such a gradual increase in temperature allows the material to become heated throughout its mass, and the thermometer accurately records the temperature of the material. Moulded compositions vary so greatly in their behaviour under heat that the examination for softening is difficult; the softening of a material tested as suggested, may be judged by fair pressure of the thumb and finger; any tendency to tackiness or softening is defined as "the temperature at which softening commences," and for practical purposes may be considered as the softening temperature.

A more difficult method of determining the behaviour of this class of materials under heat is to obtain rings of standard dimensions, place them under the pressure of a definite weight, and raise the temperature to a given maximum figure in a given time, allowing to cool under the same pressure, and measuring the amount of distortion in diameter. Whilst this test, carefully carried out, gives com-

parative figures, it is difficult to obtain some materials in a form suitable to allow of the test being made, and also the method by which the piece tested was formed affects the result.

Whether a material is inflammable or not is a matter for personal judgment, but in the suggested classification where a material has been defined as "must not support combustion," it is intended to allow that though it may burn when held in a flame, it shall not continue to do so on removal, which is reasonably non-inflammable for ordinary purposes.

Tests for mechanical properties have been specified in the classification, and for all practical purposes these meet requirements. Comparative figures may be obtained by making small beams of the composition of standard cross-section, which are tightly held in a clamp at one end, and weights are gradually added to the other end until the piece is broken. The method of manufacturing the material and pieces, however, affects the result. Chemical examination is of service in judging the ageing properties of a material.

From the foregoing remarks on tests, &c., many modifications as to methods will suggest themselves, but sufficient has been written to form a basis for standardising according to individual requirements.

Strain insulators for tramway and railway work have been omitted from this standardisation, as these require a separate classification altogether.

NOTES FROM CANADA.

[FROM OUR SPECIAL CORRESPONDENT.]

The Canadian Pacific Railway has recently acquired water powers on the Adams River in British Columbia, which will probably be utilised in connection with the electrification of sections of its line in the mountains. The available power is said to be about 100,000 H.P. altogether. A proposal is on foot to combine several electric street railway lines, so as to result in a scheme reaching from Toronto to Detroit, a distance of about 220 miles.

Water power exists in almost every part of the Dominion, and nearly every week one sees announcements of some new developments being undertaken in one province or another. In some places, where plenty of power is available, the only obstacle to its use is lack of any surrounding population, but judging from the manner in which new towns are springing up and the amazing rate at which, according to the recent census returns, existing towns are growing, this state of things will remedy itself in due time.

An example of some of these increases in population will be of interest in this connection as British manufacturers are striving, and not unsuccessfully, for a share of the trade which results from such increases. In the last 10 years the number of inhabitants of—

Calgary, Alberta,	has risen	from 4,097	to 43,736
Vancouver, B.C.	,,	27,000	to 100,333
Brandon, Manitoba	,,	5,620	to 13,837
Sidney Town, N.S.	,,	9,909	to 17,617
Lachine, Quebec	,,	5,561	to 10,778
Montreal, Quebec	,,	267,730	to 466,197
Ottawa, Ontario	,,	59,928	to 86,349
Port Arthur, Ontario	,,	3,214	to 11,216
Moose Jaw, Saskatchewan	,,	1,558	to 13,824

Not all towns, of course, show such phenomenal *growth*, but the fact remains that Canada's population is rapidly increasing, and owing to the enormous natural wealth of the country, in everything that goes to satisfy human requirements—food, minerals, timber, power, &c.—she will continue to attract ever-increasing numbers of people for many years to come.

It is good to see that the unwearied efforts of the Electrical Review to waken up British firms to the possibilities of trade here, are at last bearing fruit in an unmistakable manner. In picking up Canadian engineering papers to-day, one feels almost at home among the numerous British advertisements, so generously are these scattered through their pages.

British competition, too, is evidently making itself felt here. Only a few days ago the writer was asking a prominent member of the staff of one of the largest electrical manufacturing firms in this country for a few items of interest for this column, and he was met with words to this effect :—"Don't send any more news of contracts pending to England than goes there at present; we are getting quite enough competition lately from that quarter, as it is."

Such a remark is pleasant to hear, as it clearly shows that the home firms are to be reckoned with in spite of having to contend with both freight and duties. There is no doubt that the representatives of many British firms have come to stay, and it should be noted here that good workmanship, quick and (more important still) certain, delivery, which are greatly appreciated, are qualities attributed at present to such firms. It is to be hoped that the standard now set will not be lowered.

EARNINGS AND HOURS OF LABOUR OF WORKPEOPLE IN THE UNITED KINGDOM.

The Board of Trade recently issued a report (Cd. 5,814), being the sixth volume of a series dealing with the results of an inquiry as to the earnings and hours of labour of workpeople engaged in the metal, engineering and shipbuilding trades in 1896. The earlier volumes have dealt with textile, clothing, building and wood-working, public utility and agriculture. The present one covers information respecting 744,557 persons out of the estimated aggregate number of 1,500,000 persons employed. Of those for whom returns have been obtained we would note the following numbers :—Engineering and boat-building, 368,552 ; electrical, telegraph, &c., apparatus, 14,770 ; wire drawing and working, 8,185 ; scientific instruments, 1,760. Of the 744,557 workpeople regarding whom returns were received, 67·5 per cent. were time workers and 32·5 per cent. piece workers.

While we would commend the expenditure of the sum of 2s. to each of our readers who may be interested in economics or statistics, we now present a brief selection of the figures of chief interest to our readers.

The following table gives the average earnings of men of and above 20 years of age returned as working full time in the last pay week of September, 1906, together with the percentage number of such men whose earnings fell within the undermentioned limits :—

Industry.	Under 20s.	20s. and under 30s.	30s. and under 40s.	40s. and under 50s.	50s. and under 60s.	60s. and above.	Average earnings for full time.
Engineering and boiler-making...	9·1	32·9	38·4	13·8	3·7	2·1	32s. 5d.
Electrical, telegraph, &c. apparatus	3·1	35·2	33·9	19·5	5·5	2·8	34s. 7d.
Wire drawing and working	7·1	30·6	26·9	19·2	12·0	4·2	35s. 7d.
Scientific instruments	1·2	17·0	47·5	24·0	7·2	3·1	36s. 10d.

We have not dealt above with iron and steel, or with tin-plate workers, but would mention that 12·3 per cent. of the men engaged in the manufacture of iron and steel earn £3 per week and upwards. In the tin-plate industry, 13·0 per cent. earned £3 per week and upwards. At the other end of the scale must be mentioned 18·2 per cent. engaged in tube-making, earning less than £1 per week. For this last named industry, the average full-time earnings for a man are 28s. 3d.

It should be explained that "men" means male wage-earners of 20 years of age and upwards. The average earnings of lads and boys, women, and girls (*i.e.*, females under 18), for the four special trades mentioned, were as follows :—

Industry.	Lads and boys.	Women.	Girls.	All workpeople.
	s. d.	s. d.	s. d.	s. d.
Engineering and boiler-making	9 7	13 1	8 2	25 11
Electrical, telegraph, &c. apparatus	10 7	14 1	8 9	23 7
Wire drawing and working	11 5	13 2	7 3	26 4
Scientific instruments...	9 6	12 8	6 9	26 7

The foregoing, it must be remembered, are *full time*, and make no allowance, on the one hand, for broken time, or on the other hand, for overtime. Some trades are naturally intermittent in their

demands, and some men, therefore, may work for more than one employer.

An interesting table sets out the changes in the average wages, 1886—1896. Where comparison is practicable, we have the following figures for adult male wage-earners for a full-time week in each of these two years:—

Industry.	Average earnings for full time. 1886.	1906.	Percentage increase.
	s. d.	s. d.	
Pig-iron	26 6	34 7	30·5
Tin-plate	33 5	42 0	25·7
Engineering and boiler-making	25 9	32 5	25·9
Ship and boat building and repairing	29 3	35 11	22·8
Railway carriage and wagon building	25 2	30 9	22·2

The following table sets out the hours of labour (exclusive of meal time and overtime), together with the average number of holidays per annum in each of the four special trades mentioned:—

Industry.	Average number of hours constituting a full working week.	Average number of holidays per annum.
Engineering and boiler-making	53·1	13·7
Electrical, telegraph, &c., apparatus	52·4	11·2
Wire drawing and working	54·8	9·6
Scientific instruments ...	52·6	11·5

Some very interesting details, which space prevents our giving even in abstract, deal with the manufacture of pig-iron and the good remuneration of certain grades of metal-workers. The detailed figures relating to each industry give the variations in payment of different grades of labour in different districts, while other tables show the monthly variations in aggregate number employed in 1906 as well as the wages paid in each month. Yet other tables analyse in greater detail the distribution of wage-earners in grades of as low as one shilling per week. Others deal with piece work earnings, and others give in detail earnings in different districts.

Into the preparation of this volume of the report there must have gone an enormous amount of preliminary work,

TURIN EXHIBITION AWARDS.

The following are among the British firms who have received awards for their exhibits at Turin Exhibition, and to whom we offer our congratulations:—

Alfred Herbert, Ltd., Classes 23 and 24, Grand Prix; Classes 25 and 26, Grand Prix.
Alley & McLellan, Ltd., Class 38, Gold Medal.
A. Reyrolle & Co., Ltd., Classes 28 and 29, Grand Prix.
Babcock & Wilcox, Ltd., Classes 19 and 20, Grand Prix.
Blackstone & Co., Ltd., Classes 19 and 20, Diploma of Honour; Classes 21 and 22, Gold Medal; Class 87, Grand Prix; Classes 98 and 99, Silver Medal.
British Ackley Brake Co., Classes 39 and 40, Gold Medal.
British Vacuum Cleaner Co., Ltd., Classes 21 and 22, Diploma of Honour; Classes 72, 73 and 74, Grand Prix.
Campbell Gas Engine Co., Ltd., Classes 19 and 20, Grand Prix; Classes 28 and 29, Grand Prix; Class 87, Grand Prix.
Castner-Kellner Alkali Co., Ltd., Classes 106 and 107, Grand Prix.
Chance Bros. & Co., Ltd., Classes 9, 10 and 11, Grand Prix.
Clayton & Shuttleworth, Ltd., Classes 19 and 20, Grand Prix; Classes 21 and 22, Gold Medal; Class 87, Grand Prix.
Coventry Chain Co., Ltd., Classes 60 and 61, Diploma of Honour.
Crypto Electrical Co., Ltd., Classes 28 and 29, Gold Medal.
Doulton & Co., Ltd., Classes 72, 73 and 74, Grand Prix.
Edgar Allen & Co., Ltd., Classes 25 and 26, Gold Medal; Classes 39 and 40, Grand Prix; Class 108, Gold Medal.
E. Green & Son, Ltd., Classes 19 and 20, Grand Prix.
F. Darton & Co., Classes 6, 7 and 8, Gold Medal; Classes 9, 10 and 11, Gold Medal; Class 13, Grand Prix.
Hadfield's Steel Foundry Co., Ltd., Classes 35, 36 and 37, Grand Prix.
Hans Renold, Ltd., Classes 19 and 20, Grand Prix; Classes 21 and 22, Diploma of Honour; Class 38, Grand Prix; Classes 60 and 61, Grand Prix.
Holden & Brooke, Ltd., Classes 19 and 20, Grand Prix.
John Fowler & Co. (Leeds), Ltd., Class 87, Grand Prix.
John J. Griffin & Sons, Ltd., Classes 9, 10 and 11, Gold Medal; Classes 15 and 16, Gold Medal; Class 32, Diploma of Honour; Classes 33 and 34, Gold Medal; Classes 112 and 113, Grand Prix.
Johnson, Matthey & Co., Ltd., Classes 112 and 113, Grand Prix.
J. and H. McLaren, Classes 19 and 20, Grand Prix; Classes 35, 36 and 37, Grand Prix; Class 87, Grand Prix.
Lancashire Dynamo & Motor Co., Ltd., Classes 28 and 29, Gold Medal.
Marconi Wireless Telegraph Co., Class 31, Grand Prix.
Marshall, Sons & Co., Ltd., Classes 19 and 20, Grand Prix; Classes 35, 36 and 37, Grand Prix; Class 87, Grand Prix.
Morgan Crucible Co., Classes 28 and 29, Grand Prix.
Muirhead & Co., Ltd., Classes 28 and 29, Diploma of Honour.
Nalder Bros. & Thompson, Ltd., Classes 33 and 34, Grand Prix.
National Gas Engine Co., Ltd., Classes 19 and 20, Grand Prix.
Negretti & Zambra, Classes 9, 10 and 11, Grand Prix; Class 13, Grand Prix.
Ozonair, Ltd., Classes 28 and 29, Gold Medal; Class 32, Grand Prix; Classes 43 and 44, Gold Medal; Classes 43 and 44, Gold Medal; Classes 67 and 68, Grand Prix; Classes 69 and 70, Grand Prix; Class 75, Diploma of Honour; Classes 83 and 84, Grand Prix; Class 101, Grand Prix; Class 105, Diploma of Honour; Classes 112 and 113, Silver Medal; Class 114, Silver Medal.
Pulsometer Engineering Co., Ltd., Classes 9, 10 and 11, Gold Medal; Classes 112 and 113, Diploma of Honour.
Reason Manufacturing Co., Ltd., Classes 33 and 34, Gold Medal.
Reavell & Co., Ltd., Classes 19 and 20, Gold Medal; Classes 21 and 22, Diploma of Honour.
Richard Garrett & Sons, Ltd., Classes 19 and 22, Grand Prix; Classes 35, 36 and 37, Grand Prix; Class 38, Grand Prix; Class 87, Grand Prix.
Richard Hornsby & Sons, Ltd., Classes 19 and 20, Grand Prix.
Robert W. Paul, Classes 33 and 34, Grand Prix.
Ruston, Proctor & Co., Ltd., Classes 19 and 20, Grand Prix and Diploma of Merit; Classes 21 and 22, Gold Medal; Classes 35, 36 and 37, Grand Prix and Special Congratulations; Class 87, Grand Prix.
Silica Syndicate, Ltd., Classes 112 and 113, Grand Prix.
Simms Magneto Co., Ltd., Classes 60 and 61, Gold Medal.
Sir W. G. Armstrong, Whitworth & Co., Ltd., Classes 60 and 61, Diploma of Honour.
Synchronome Co., Classes 6, 7 and 8, Diploma of Honour.
Thermal Syndicate, Ltd., Classes 106 and 107, Grand Prix; Classes 112 and 113, Diploma of Honour.
Underfeed Stoker Co., Ltd., Classes 19 and 20, Grand Prix; Class 75, Gold Medal.
Venner Time Switches, Ltd., Classes 28 and 29, Gold Medal; Class 30, Silver Medal.
Westinghouse Electric Co., Ltd., Classes 28 and 29, Grand Prix.
W. & T. Avery, Ltd., Classes 6, 7 and 8, Gold Medal.

The Cambridge Scientific Instrument Co., Ltd., exhibited in Classes 9, 10, 11, 13, 14, 31, 33 and 34; but were *hors concours*.

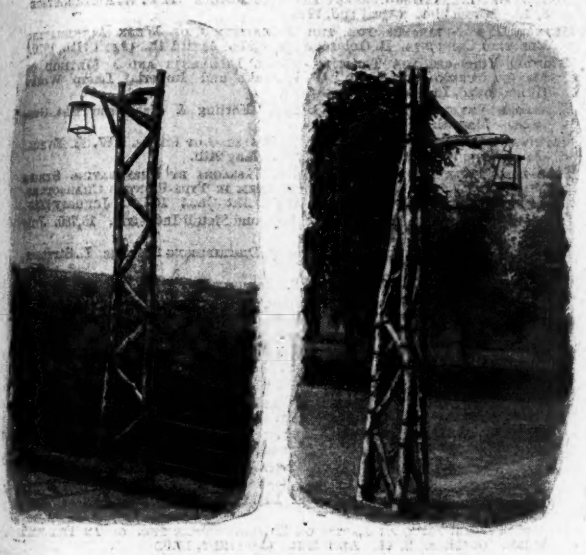
ELECTRIC LIGHTING IN A CARDIFF PARK.

Roath Park, the largest of Cardiff's parks, is situated at one of the tramway termini; it comprises several separate parks extending 1½ miles in length. The most popular section is the Lake and Botanical Gardens. The lake covers 25 acres, and here botanising, fishing and swimming can be indulged in. Music is provided very frequently in the summer season, and the thousand odd chairs around the band-stand are well patronised. A park with such attractions is, naturally, a source of revenue to the Tramways Department, and the Tramways Committee has several times made grants in aid towards the expense of bands. It has been usual during the last few years to close the lake to the general public on occasions during the season and let it out for the purposes of holding fêtes and swimming galas in connection with various local clubs, and the Park Committee came to the conclusion that the money spent by the promoters of galas on Chinese lanterns and similar decorations, would willingly be given for much more effective electrical illuminations. In addition, it was felt that it was a pity to close the park at dusk when music could be enjoyed in the cool of the evening. A scheme was therefore prepared by the city electrical engineer, to the park superintendent's requirements, which provided for about 30 pillars in the different walks, the lighting of the bandstand, and arrangements for temporary decorative strip-lighting amongst the trees, outlining the band-stand, &c., and a supply to a floating band-stand; the strip-lighting was only in use on the special occasions referred to.

There was every possibility of the lighting being considerably extended, and as the mains were some distance away, the first scheme provided for H.T. feeders and transformers, but this was dropped on the score of expense, although the arrangement now includes an extension of the L.T. mains with H.T. cable to a central distributing point, so that in the future, if necessary, a change over can be made by running back some little distance to the nearest H.T. feeder. The switch pillars contain D.P. fuses, a S.P. knife switch to each circuit, and a meter in the line. A drop in pressure was anticipated, so a small auto-transformer giving a permanent boost in five-volt steps up to 20 is placed in the base of the pillar. The circuits now connected will deal with 10 KW., and when the demand exceeds this, a H.T. service will be necessary. The work carried out has as far as possible been in keeping with the surroundings, and the facts that the installation would be handed over to the parks superintendent, and that numbers of people—including small boys—frequent the park, have been kept in view. There are three circuits running from the pillar, and from here all lights can be switched on. The band-stand lighting has switches controlling it, and switches are also

provided for strip lighting; the three circuits can all be looped up through straight-through disconnecting fuse boxes. This is useful at times in many ways which will occur to our readers.

The supply is two-wire (200 volts) with paper-insulated cable laid direct in the ground, and wire-armoured rubber-covered cable for the lamp services. All fusing is carried out with Siemens Zed type fuses, so that the renewal of a fuse of correct size by any of the



Rustic Lamp-posts at Cardiff.

park men is a simple matter. In the ground near the base of each pillar is fixed a small service box, fused on one pole, with a link on the other side. The service cable ends in an "Indispenso" connector, so that the lamp fitting, which is just hung on a hook, can be removed for the winter, &c. Connections can also be taken off these connectors for strip lighting in festoon between pillars. It was first suggested that ornamental cast-iron pillars should be used, but there were many difficulties in the way of making a satisfactory and economical job; several designs for wood pillars were sub-

Another Design of Wood Lamp-post.

mitted to the Parks Committee, and three different designs are now in use (see figs.). The bandstand was outlined with about 600 small candle-power lamps, and about 500 lamps, spaced 2 ft. centres, were used along the park paths. The permanent lighting for the band-stand was carried out with stem pendants and Holophane shades. All movable material is transferred to the stores during the winter. The parks superintendent has reported that music was continued during the evenings for six weeks longer than the usual period on account of this lighting. To keep people within the bounds of the lighting area dwarf railings are thrown across the various paths. Whilst the revenue obtained from this lighting is not large at present, it is a load that can be easily dealt with and will no doubt develop; indirectly, it is of much benefit to the general public and the tramways department.

We are indebted to Mr Arthur Ellis, the manager of the Cardiff electricity and tramway undertakings, for the above particulars.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

Amendments.

RUSSIA.—In connection with a Bill which it is proposed to introduce into the Russian Duma for the encouragement of the manufacture in Russia of agricultural machinery and implements, it is proposed to admit duty free upon request foreign-made machinery and stands necessary for the equipment of works manufacturing agricultural machinery of the four following categories: (*a*) Portable engines for steam threshing machines; (*b*) threshing machines; (*c*) reaping and sheaf-binding machines; (*d*) reaping machines with automatic ejectors.

NORTHERN NIGERIA.—The Customs Tariff (Amendment) Proclamation of 1911 provides that, from January 27th, 1911, the rates of duty leviable on goods imported into Northern Nigeria shall be the same as those levied in Southern Nigeria.

DENMARK.—The Customs authorities have recently issued the following decisions regarding the duties to be levied on certain safety plugs:—

Safety Plugs of Porcelain and Brass.—When possessing the characteristics of manufactures of porcelain in combination with metal	·70 krona per kg.
When none of the component parts can be regarded as giving their characteristics to the goods	7½ % *ad val.*

N.B.—Krona = 1s. 1½d.

UNITED STATES.—The following revised circular relative to the inclusion of commission, &c., in Consular invoices for goods shipped to the United States of America has recently been addressed by the Treasury Department to officers of the United States Customs:—

The Department is advised that it is the practice of some shippers not to include in their Consular invoices commissions and other charges paid to them as agents for services in purchasing and shipping goods, while it is the practice of other shippers to include in their invoices such charges.

As this difference of practice is confusing to the appraising officers, you are hereby instructed that a strict compliance with the provisions of Article 669 of the Consular Regulations of 1896 should be required.

Article 669 of the Consular Regulations requires that shippers of goods subject to an *ad valorem* rate of duty, wholly or in part, or to a duty based upon their value, must in all cases set forth separately in the invoice:—

1. The net price of the merchandise, free from all charges of commission, packing, &c., or, in case of merchandise shipped on consignment, the actual net market value thereof in the principal markets of the country from which the shipment is made, by its weight, measure or quantity.
2. The cost of transportation to the port of shipment.
3. The amount of packing charges, including boxing, tilloting, packing, cartons, &c.
4. Insurance, commissions, discounts, legalisations, and all costs of any kind, nature, or description incurred in preparing the goods for the market of the United States, separately set forth.

When, however, it is impossible for the shipper to give the information required under the third and fourth heads, or any of them—as, for instance, when such charges or any part of them are non-existent or unascertained at the time of shipment, or are to be paid by the consignee—such items may be omitted, the cause of omission being stated instead.

For statistical purposes, exporters should specify in invoices of merchandise, free or subject to a specific rate of duty, all costs, charges, expenses, &c., separately from the actual cost of the goods.

Motor Exhibition at Baku.—The International Exhibition of gas and oil engines, electric motors, compressors and automobiles, which was originally to be opened at Baku in September of this year, has been postponed until April 1st, 1912. Tariff-free import of exhibits is to be allowed, provided the machinery is re-exported within a period of six months. The permanent German industrial Commission on Exhibitions has been carefully investigating the conditions, and has come to the conclusion that, although Baku offers a good market for certain types of machinery, it would hardly pay German firms to take up the question of exhibiting there to any great extent. In the case of the larger firms, their own agents on the spot can decide whether an exhibit would be of value, whilst smaller firms who wish to get a footing in the country will probably not find the exhibition of as much advantage to them as the introduction of a good agent. The visitors to the exhibition will be for the most part local people. At the same time the Commission has received private information, chiefly from manufacturers of oil engines suitable for boring operations, strongly advocating German participation.—*E.T.Z.*

NEW PATENTS APPLIED FOR, 1911.

(NOT YET PUBLISHED.)

Compiled expressly for this journal by Messrs. W. P. Thompson & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

22,740. "Means of controlling electrical and physical instruments." J. W. Record. October 16th.

22,757. "Regulation of alternating current machinery and means therefor." Siemens Bros. Dynamo Works, Ltd. (F. E. Thrupp, India.) October 16th. (Complete.)

22,759. "Electrolytic apparatus." A. E. Knowles. October 16th.

22,771. "External contact electric bell push." G. E. Lehrs. October 16th.

22,779. "Electric lights." A. W. Gast. October 16th. (Complete.)

22,799. "Trolley heads for overhead electric tramways." G. E. Wadsworth and H. Pridham. October 16th.

22,803. "Calling circuits for automatic telephone systems." Siemens Bros. and Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) October 16th. (Complete.)

22,804. "Selecting devices for telephone systems." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) October 16th. (Complete.)

22,805. "Subscribers' instrument set for automatic telephone exchange." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) October 16th. (Complete.)

22,868. "Means of jointing and bonding between lead-covered or lead-covered and armoured electric cables, and cast-iron, wrought-iron or mild-steel sleeves or joint boxes." R. B. Mitchell and F. J. Cooper. October 17th.

22,882. "Electrical means for the synchronism of talking machines, musical instruments and the like, with animated pictures, and the like." G. H. Cricks, J. H. Martin and C. A. Bannister. October 17th.

22,887. "Accumulators or the like for different purposes and arrangements therefor for different purposes." G. J. Epstein. October 17th.

22,890. "Electric-current generating and motive-power machine." W. S. Frost. October 17th.

22,895. "Electrical switches." C. L. Terry and P. Townsend. October 17th. (Complete.)

22,914. "Electric switch mechanisms." P. A. Newton. (Gray National Telautograph Co., United States.) October 17th. (Complete.)

22,983. "Intercommunication telephone systems." British Insulated and Helsby Cables, Ltd., W. A. Aitken, H. Cooper and C. Remington. October 18th.

22,987. "Dynamo-electric machines." E. R. Clarke. October 18th.

22,988. "Electric light fittings." Simplex Conduits, Ltd., and T. Birkett. October 18th.

22,992. "Electrical heating devices." J. F. Monnot. (Convention date, November 19th, 1910, France.) October 18th. (Complete.)

23,015. "Dynamo-electric machinery." Hon. Sir C. A. Parsons and A. H. Law. October 18th.

23,025. "Negative electrodes for electrolysis, cataphoresis and osmosis." Dental Manufacturing Co., Ltd., and A. B. Tugman. October 18th.

23,056. "Controlling of electric motors from some other room than the one in which motor is fixed." J. Bond. October 19th.

23,080. "Coin-freed mechanism for telephones." M. Pledath. October 19th.

23,118. "Telephone transmitters." G. H. Nash and Western Electric Co., Ltd. October 19th.

23,122. "Calling apparatus for telephones and the like." P. W. Wall. October 19th.

23,162. "Electrical switches or contact make-and-break devices." R. R. Smith and F. B. Cox. October 20th.

23,172. "Field telephone and telegraph set." A. J. Stephens. October 20th.

23,180. "Methods of heating rooms by electricity." A. H. Barker. October 20th.

23,182. "Electro comb with spring controlled yielding teeth and alternate poles." G. Meyer. October 20th. (Complete.)

23,185. "Imitation X-ray illusion." A Coke. October 20th.

23,191. "Electric vibrators." A. H. Nicholson. October 20th.

23,240. "Sparking plugs applicable for internal combustion engines." P. L. Johnson and F. J. S. Kilgour. October 21st.

23,261. "Storage battery electrode." W. Morrison. October 21st. (Complete.)

23,265. "Construction of electrical accumulator." P. Marino. October 21st. (Complete.)

23,283. "Means for varying the inductance of electric circuits." G. Schieferstein. (Addition to and divided application on 12,978 of 1911, May 30th.) October 21st. (Complete.)

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of Messrs. W. P. Thompson & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1910.

Dynamo-Electric Machinery. R. A. Hoibech. 15,587. June 29th.

Apparatus for Transcribing Telegraphic Characters. A. O. Urban. 22,697. September 30th.

Electric Motors for Transmitting at a Distance Angular Movements Overcoming Considerable Resistances. R. Girardelli. 22,714. September 30th. (November 23rd, 1910.)

Apparatus for Sterilising Liquids by Ultra-Violet Rays. V. Henri, A. Helbronner and M. von Recklinghausen. 23,077. October 5th.

Transmitting Apparatus for Wireless Telegraphy. J. A. Fleming. 23,242. October 7th.

Electrical Connectors. J. C. Royce. 23,445. October 10th.

Single-Phase Alternating-Current Motors. B. Parker-Haigh. 26,984. November 21st. (Cognate application, No. 9,957 of 1911.)

Carbon Brushes for Dynamo-Electric Machines. S. Beeton and Morgan Crucible Co. 27,162. November 22nd.

Electric Arc Lamps. A. Blondel. 27,989. December 1st. (April 21st, 1910. Addition to No. 4,677 of 1906.)

Apparatus for use in the Electrodeposition of Iron. S. O. Cowper-Coles. 28,592. December 8th.

Automatic Multi-Fuse Electric Cut-Outs. R. Romeu. 28,810. December 12th.

Vapour Electrical Apparatus of the character known as Mercury-Vapour Lamps or the like. Brush Electrical Engineering Co. and A. E. Salisbury. 28,991. December 14th.

1911.

Electrical Device for Receiving and Transmitting Telegraphic and Telephonic Messages. E. D. Glendall. 3,630. February 18th.

Generation of Electric Energy. J. Maes. 5,457. March 4th.

Anodes for use in the Electrolytic Treatment of Alkaline Salt Solutions. A. K. T. Estelle. 5,734. March 7th. (March 9th, 1910.)

Electric Motors. Anschutz & Co. 5,866. March 8th. (November 18th, 1910.)

Variable Frequency Commutator Dynamo-Electric Machines. Akt.-Ges. Brown, Boveri et Cie. 7,061. March 21st. (April 11th, 1910.)

Spark Plugs. H. E. Maher. 7,108. March 21st. (April 28th, 1910.)

Control of Alternating-Current Electric Motors. E. F. W. Alexanderson. 8,149. March 31st. (April 2nd, 1910.)

Method and Apparatus for the Intensifying of Weak Alternating Electric Currents. R. Goldschmidt. 8,978. April 11th. (April 11th, 1910.)

Electric Furnaces for Treating Metal Filaments and a Method of Manufacturing the same. G. Ludecke and Imperial Lamp Works (Brimsdown), Ltd. 8,996. April 11th.

Rainproof Ventilator for Arc Lamps. Körting & Mathiesen Akt.-Ges. 10,886. May 5th. (May 6th, 1910.)

Machine for the Continuous Electric Welding of Seams. W. E. Evans. (Allgemeine Elektricitäts Ges.) 12,585. May 24th.

Telegraph Instrument for Receiving Messages by Perforating Strips and at the same time Reproducing them in Type-Printed Characters. Siemens Bros. & Co. (Siemens & Halske Akt.-Ges.) 15,183. January 28th.

Electric Arc Lamps. Ges. für Maschinen und Metall Industrie. 15,730. July 16th. (July 6th, 1910.)

Equalising Arrangements for Electrical Distributing Systems. L. Strasser. 168. January 3rd.

Dynamo Connection. H. Leitner. 709. January 10th.

Automatic Electrical Signalling Apparatus for Railways. Automatic Electric Block Signalling Co. and R. P. Brousson. 1,048. January 14th.

Manufacture of Metal Filaments for Electric Lamps. W. C. Heraeus Ges. and C. Trenzen. 1,544. January 20th. (Convention date not granted.)

Electric Furnaces. J. H. Reid. 1,609. January 21st.

Electric Cut-Outs. H. Hirst and F. M. Chapman. 1,914. January 25th.

Compounding of Commutator Dynamo-Electric Machines. Akt.-Ges. Brown, Boveri et Cie. 4,256. February 20th. (February 19th, 1910.)

Apparatus for Treating Liquids with Ultra-Violet Rays. V. Henri, A. Helbronner and M. von Recklinghausen. 4,895. February 27th.

Operation of Electrical Clock Installations. H. Aron Elektricitäts Zahlerfabrik Ges. 7,862. March 29th. (January 7th, 1911.)

Electric Switches. Pintsch's Patent Lighting Co. and C. H. Vidal. 9,005. April 11th.

Device for Indicating an Earth or Ground Connection of an Electric Line. G. Giles. 9,745. April 21st. (April 21st, 1910.)

Calling Circuit Arrangements for Automatic and Semi-Automatic Telephone Exchanges. Siemens Bros. & Co. (Siemens & Halske Akt.-Ges. 14,144. June 14th.

Trade with Italy.—Some useful hints for the furthering of trade with Northern Italy are set forth by the *Elektrotechnische Nachrichten*. Before linking business connections or entrusting agencies to native houses, home firms should, says the German paper, exhaustively inform themselves of the credit standing, and business aptitudes of the prospective agents. Such information in the majority of cases cannot be supplied by the Consulates, owing to the great extent of Milan and the diversity of the businesses. Exact information with regard to unknown firms is only obtainable by the Consuls employing other means. The Consulates accordingly fall back on one or the other locally established trade information bureaus. By this method, however, no limit is set to expense, and the Consular intervention tends to much loss of time. German firms are advised, as a better course, to apply direct to such bureaus, of which the following are recommended:—The Schimmelpfeng Institute, 5, Passagio Carlo Alberto; or the branch of the Leipzig Kreditreform Union, the Associazione Kreditreform, 5, Via A. Manzoni. It is further said:—Lists of the names of the retailers in a particular branch of trade which the Consuls are often called upon to supply, cannot, in the generality of cases, be supplied by them, owing to the multiplicity of the names. Such information is furnished by the firm E. Finetti & Co., 2, Passagio Galleria de Cristoforis.

Norwegian Nitrate Undertakings.—It was recently mentioned that one of the leading German chemical companies, acting for itself and two other chemical firms who are jointly interested, had decided to dispose of most of the share held in two Norwegian power and nitrate companies. It is estimated that the share is represented by £1,250,000, and on the completion of the transfer to the Norsk Hydro-Elektrisk Co., the total German interests will be reduced to £250,000. Various statements are forthcoming by way of explanation of the withdrawal of Teutonic influence from the undertakings concerned. On the one hand, it is stated that the retirement is due to the obstruction which German capital and work meet with in Norway. On the other, it is declared that the Germans desire to distribute the very considerable risk over a larger number of persons. A further assertion is that the large amount of capital invested in the power and nitrate enterprises could only produce a less remunerative yield than the capital invested in the German chemical works. At any rate, the withdrawal of Teutonic interests is all the more remarkable, as the completion of the Norwegian nitrate scheme is said to be in sight. The works are to place nitrate on the market next year, and it was recently reported from Christiania that the first section of the Rjukan Falls works was nearing completion.

Electrolytic Copper-Refining in Norway.—A company has applied for a concession to work and eventually purchase the Aamdal copper deposits at Skafse, in the district of Telemarken. The company has a capital of about £14,000, subscribed by Norwegians. It is intended to use an electrolytic process of extraction invented by Mr. V. Hybinette, who is understood to be a Swedish engineer.—*Board of Trade Journal.*